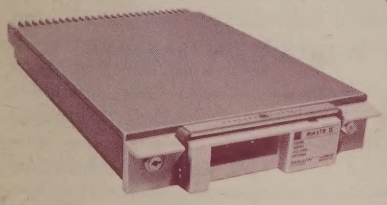
DM H / UHF

MOBILE RADIO

MASTR® II

MAINTENANCE MANUAL LBI 30250C

DATAFILE FOLDER – DF 9031



MOBILE RADIO

CONTROL UNIT

406-512 MHz
20/40/75/100-WATT
TWO-WAY FM
MOBILE
COMBINATIONS

SPEAKER

GENERAL ELECTRIC

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SYSTEM INTERCONNECTION DIAGRAM (See Control Unit & System Board Maintenance Manual)

ILLUSTRATIONS

Figure 1 - Module Layout 1

WARNING

Although the highest DC voltage in MASTR II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized 12-Volt circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

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EQUIPMENT INDEX

EQUIPMENT	MODEL OR TYPE NUMBER
Transmitter and Receiver	Refer to the Applicable Maintenance Manual
Exciter/PA Cable	5491689P86
Receiver Antenna Cable Standard With RF Pre-Amp (UHS)	 5491689P83 5491689P77
Control Unit	Refer to Applicable Control Unit Maintenance Manual
Microphone	Refer to Applicable Control Unit Maintenance Manual
Speaker	Refer to Applicable Control Unit Maintenance Manual
Antenna	Refer to Applicable Control Unit Maintenance Manual
Power/Control Cable	Refer to Applicable Control Unit Maintenance Manual
12-Volt Fuse Assembly	Refer to Applicable Control Unit Maintenance Manual
Ignition Switch Cable Assembly	19B219537G4
Microphone Bracket	7141414G2
Channel Guard Microphone Hookswitch	19C320318G1
Extractor Tool Kit	19B227456G1
Mounting Hardware	19A129474G1
Key (BF10A)	5491682P8
Alignment Tools	19B219676G1 19B219678P1
OPTIONS	
Power/Control Cables 9-Foot, 18-Conductor 9-Foot, 30-Conductor 9-Foot, 38-Conductor 27-Foot, 18-Conductor 27-Foot, 30-Conductor 27-Foot, 38-Conductor	 19D423424G1 19D423424G7 19D423424G13 19D423424G3 19D423424G9 19D423424G15
Handset Hookswitch	19C320478G1 19B219846G1
12-Volt 3-Wire Ignition Switch Cable Assembly	19B219537G1

SYSTEM SPECIFICATIONS*

FREQUENCY RANGE	406-512 MHz
BATTERY DRAIN	
Receiver	
Squelched	0.250 Amperes
Unsquelched	2.40 Amperes
Transmitter	
20 Watt (KT-35B,D)	6.0 Amperes at 13.8 VDC
40 Watt (KT-36B,D)	12.0 Amperes at 13.6 VDC
75 Watt (KT-112A,C)	19.0 Amperes at 13.6 VDC
100 Watt (KT-37A,C)	27.5 Amperes at 13.4 VDC
FREQUENCY STABILITY	
-40°C to +70°C +0.0005%	KT-35-B, KT-36-B, KT-112-A, KT-37-A
0°C to +55°C +0.0002%	KT-35-B, KT-36-B, KT-112-A, KT-37-A
-40°C to +70°C +0.0002%	KT-35-D, KT-36-D, KT-112-C, KT-37-C
DIMENSIONS (H X W X D)	
Two-Way Radio	2-1/2" x 11-3/4" x 18-3/4"
C-500 Series Control Unit (less bracket)	2-1/4" x 6-11/16" x 5"
Speaker (less bracket)	5-1/8" x 5-1/8" x 2-13/16"
WEIGHT	
Two-Way Radio (includes mounting plate)	26 pounds
C-500 Series Control Unit	1-1/4 pounds
Speaker	1-1/2 pounds
TEMPERATURE RANGE	-40°C to +70°C (-40°F to +158°F)
DUTY CAPABILITY	
Intermittent	20% Transmit, 100% Receive
Continuous	100% Transmit at reduced power

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits	10th Digit
Mechanical Package	System Voltage	Power Output	Channel Spacing	Frequency Capability	Number of Freq.	Options	Frequency Range	Oscillator Stability
M Standard	**C** ±12-VDC	**4** 20 Watts	**5** 25 kHz	**A** 1-Freq.	**A** 1-Freq. Xmit 1-Freq. Rec.	**S** Standard	**77** 406-420 MHz	**A** ±5 PPM (±.0005%)
	X ±12-VDC Less Accessories	**5** 40 Watts		**C** 2-Freq.	**B** 2-Freq. Xmit 1-Freq. Rec.	**U** Channel Guard	**78** 420-450 MHz	**B** ±2 PPM (±.0002%)
		6 75 Watts		**K** 8-Freq.	**C** 2-Freq. Xmit 2-Freq. Rec.	**P** UHS Receiver	**88** 450-470 MHz	
		7 100 Watts			**D** 1-Freq. Xmit 2-Freq. Rec.	**Q** UHS Receiver & Channel Guard	**89** 470-494 MHz	
					E 3-Freq. Xmit 3-Freq. Rec.		**91** 494-512 MHz	
					F 4-Freq. Xmit 4-Freq. Rec.			
					G 5-Freq. Xmit 5-Freq. Rec.			
					H 6-Freq. Xmit 6-Freq. Rec.			
					J 7-Freq. Xmit 7-Freq. Rec.			
					K 8-Freq. Xmit 8-Freq. Rec.			

DESCRIPTION

MASTR II mobile radio combinations are compact, highly reliable and ruggedly-constructed units that are designed to meet the most stringent requirements in the two-way radio field.

The radios are fully transistorized -- utilizing both discrete components and Integrated Circuits (IC's) for highest reliability. Since no tubes are used, the radio is ready to use the instant it is turned on. The standard combination may be equipped with the following:

- One through eight frequencies
- Plug-in oscillators for ±0.0002% or ±0.0005% oscillator stability
- Channel Guard (tone squelch)
- Ultra High Sensitivity (UHS) pre-amplifier

The radio set is housed in a drip-proof case only 2-1/2 inches high. The radio mounts to the vehicle by a bottom mounting plate, and is tamper-proof when locked into the mounting plate. When unlocked, the handle can be pulled down and the radio pulled out of the mounting plate or the top cover removed for servicing. When the handle is pulled down 90 degrees, the radio can be locked to hold the handle in the carrying position.

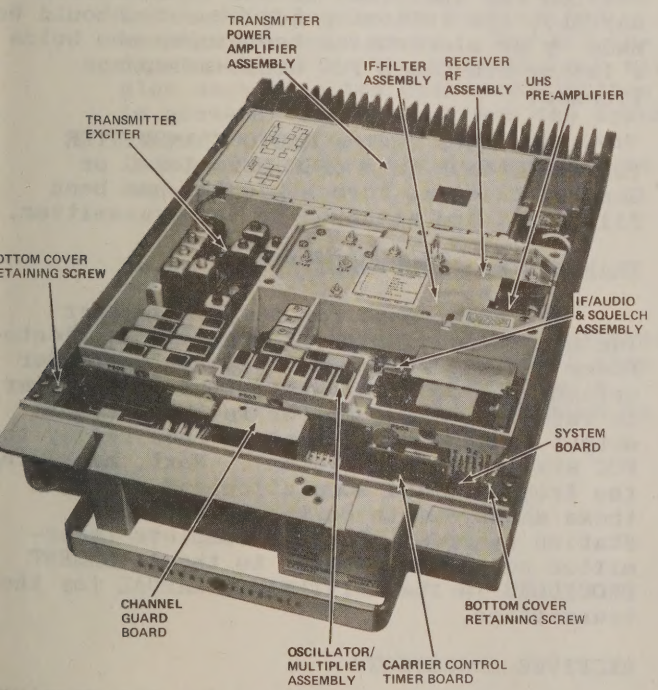

Figure 1 - Module Layout

No power supply is required since the highest supply voltage used in the radio is supplied by the vehicle battery.

The radio is of single-layer, modular construction with all major modules and tuning adjustments easily accessible from the top of the radio (see Figure 1).

Centralized metering jacks for the transmitter, receiver and system board are provided for simplified alignment and troubleshooting.

Both the transmitter and receiver are electrically isolated from the radio chassis to permit operating in 12-Volt, positive or negative ground vehicles without the use of a polarity converter. The transmitter exciter and receiver modules are mounted in a Lexan® frame for isolation. Simply changing four leads to the control unit and reversing the power leads at the plug end allows the radio to be used in negative or positive ground vehicles. No changes are required in the radio.

TRANSMITTER

The transmitter consists of an exciter board located in the mounting frame, and a power amplifier assembly. The PA assembly consists of a PA board(s) and a Low Pass Filter Board (with a hermetically sealed antenna switch) mounted on a heat sink casting.

RECEIVER

The receiver consists of an oscillator/multiplier assembly (Osc/Mult), RF assembly, IF-Filter assembly, and IF-audio and squelch assembly (IFAS). In UHS receivers, the pre-amplifier mounts in the area near the antenna input board.

C-500 SERIES CONTROL UNIT

The control unit contains the power on-off rocker switch, volume and squelch controls, channel selector switch in multi-frequency models, a red transmit indicator light and a power on/frequency indicator light. Space is provided for an optional rocker switch, and two optional indicator lights.

The control unit is enclosed in a two piece molded Lexan® housing, and is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety. This mounting assembly also permits the control unit to be swiveled as desired for the convenience of the operator.

Three connectors are located on the rear of the control unit. Two of the connectors are for the control cable(s), and one (Vehicle Systems Jack J701) is for power, accessories and external options.

MICROPHONE AND HANDSET

MASTR II mobile combinations use a dynamic microphone with a built-in transistorized microphone pre-amplifier. The microphone is housed in a sturdy Lexan® case, and the extendable coiled cord plugs into the microphone jack on the bottom of the control unit. The plug is secured to the jack by a retaining screw.

An optional telephone-type handset is available for use with the radio. The handset uses a dynamic microphone with a built-in microphone pre-amplifier. The extendable coiled cord plugs into the microphone jack on the bottom of the control unit, and is secured to the jack by a retaining screw.

HOOKSWITCHES

In Channel Guard applications, a microphone or handset hookswitch is supplied with the radio. The hookswitches are equipped with a Channel Guard disable switch.

Placing the switch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the Channel Guard is disabled when the microphone or handset is removed from the hookswitch.

SPEAKER

A five-inch speaker contained in a Lexan® housing provides an audio output of 12 Watts. The speaker impedance is eight ohms. The speaker leads are terminated in Vehicle Systems Plug P701 which connects to J701 on the rear of the control unit.

The speaker is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety, and permits the speaker to be swiveled as desired to direct sound to the operator.

PRE-INSTALLATION CHECK

MASTR II radios are shipped from the factory completely connected to permit the serviceman to perform system checks on the transmitter and receiver without removing the radio from its shipping container. Simply removing the lid on the internal packing case provides access to the battery cables, ignition switch cables, microphone, control unit and radio antenna jack. The radio is shipped connected for 12-Volt, negative ground operation.

CAUTION

Before bench testing the MASTR II Mobile Radio, be sure of the output voltage characteristic of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed
(50 ohm resistive load): 18 Volts
Transmitter keyed
(no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limit shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.8 VDC for loads below 6 amperes; 13.6 VDC for loads of 6 to 16 amperes; 13.4 VDC for loads of 16 to 36 amperes). Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

INITIAL ADJUSTMENT

After the MASTR II Radio has been installed (as described in the INSTALLATION MANUAL), the following adjustments should be made by an electronics technician who holds a 1st or 2nd Class FCC Radio-telephone license.

Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form NP270303) has been filled out and attached to the transmitter.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the Forward and Reflected Power and adjusting the antenna length for optimum ratio, then setting the transmitter to rated power output (or to the specific output or input which may be required by the FCC station authorization). Next, measuring the frequency and modulation and entering these measurements on the FCC-required Station records. For the complete transmitter adjustment, refer to the ALIGNMENT PROCEDURE in the MAINTENANCE MANUAL for the transmitter.

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. For the Receiver Initial

Adjustment Procedures, refer to the FRONT END ALIGNMENT PROCEDURES in the MAINTENANCE MANUAL for the receiver.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR's MANUAL. The basic procedures for receiving and transmitting messages follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by pressing the POWER-ON rocker switch to the ON position.
2. Turn the SQUELCH control clockwise (to the right) as far as possible.
3. Adjust the VOLUME control until the noise is easily heard, but is not annoyingly loud.
4. Now, slowly turn the SQUELCH control counterclockwise (to the left) until the noise just fades out.

The radio is now ready to receive messages from other radios in the system.

TO TRANSMIT A MESSAGE

1. Turn the radio on as directed in the "To Receive a Message" section.
2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal voice. Release the button as soon as the message has been given. The red indicator light on the control unit will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever the transmitter is keyed.

MAINTENANCE

Removing IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the checks as listed in the table of Maintenance Checks.

TEST AND TROUBLESHOOTING PROCEDURES

The individual Maintenance Manual for the transmitter and receiver describe standard test procedures which the serviceman can use to compare the actual performance of the transmitter or receiver against the specifications of the unit when shipped from the factory. In addition, specific troubleshooting procedures are available to assist the serviceman in troubleshooting the transmitter and receiver.

NOTE

In positive ground operation only, A- is "hot" with respect to vehicle ground. Shorting the receiver front end casting or any printed wiring board ground patterns to the radio case may cause one of the in-line fuses to blow.

MECHANICAL PARTS BREAKDOWN

A mechanical parts breakdown diagram of the two-way radio is provided in this manual. The diagram shows the placement and GE Part Number of mechanical items on the Two-Way radio set (see Table of Contents).

RE-INSTALLATION

If the radio is ever moved to a different vehicle, always check the battery polarity and voltage of the new system before using the radio.

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

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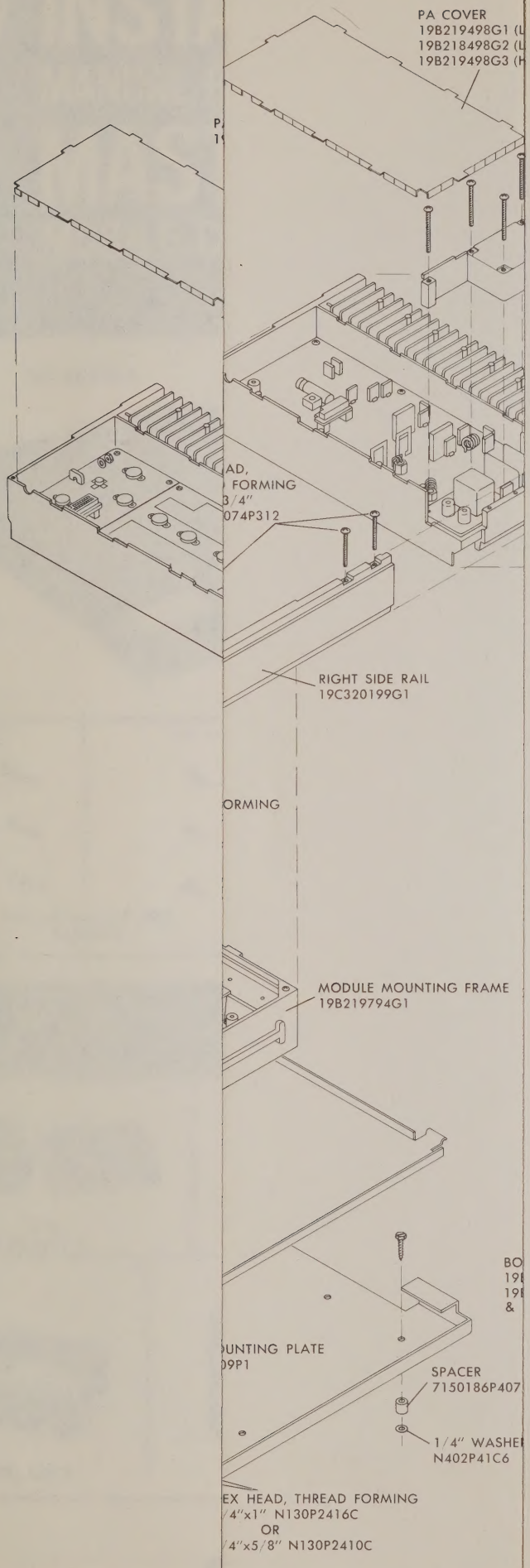

MECHANICAL PARTS BREAKDOWN

MASTR II STANDARD COMBINATIONS

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

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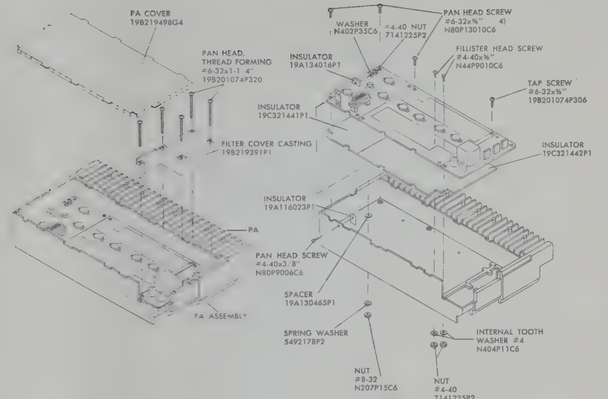
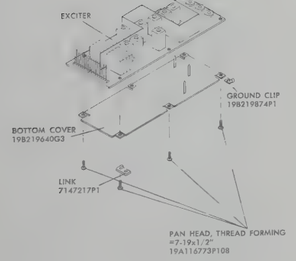
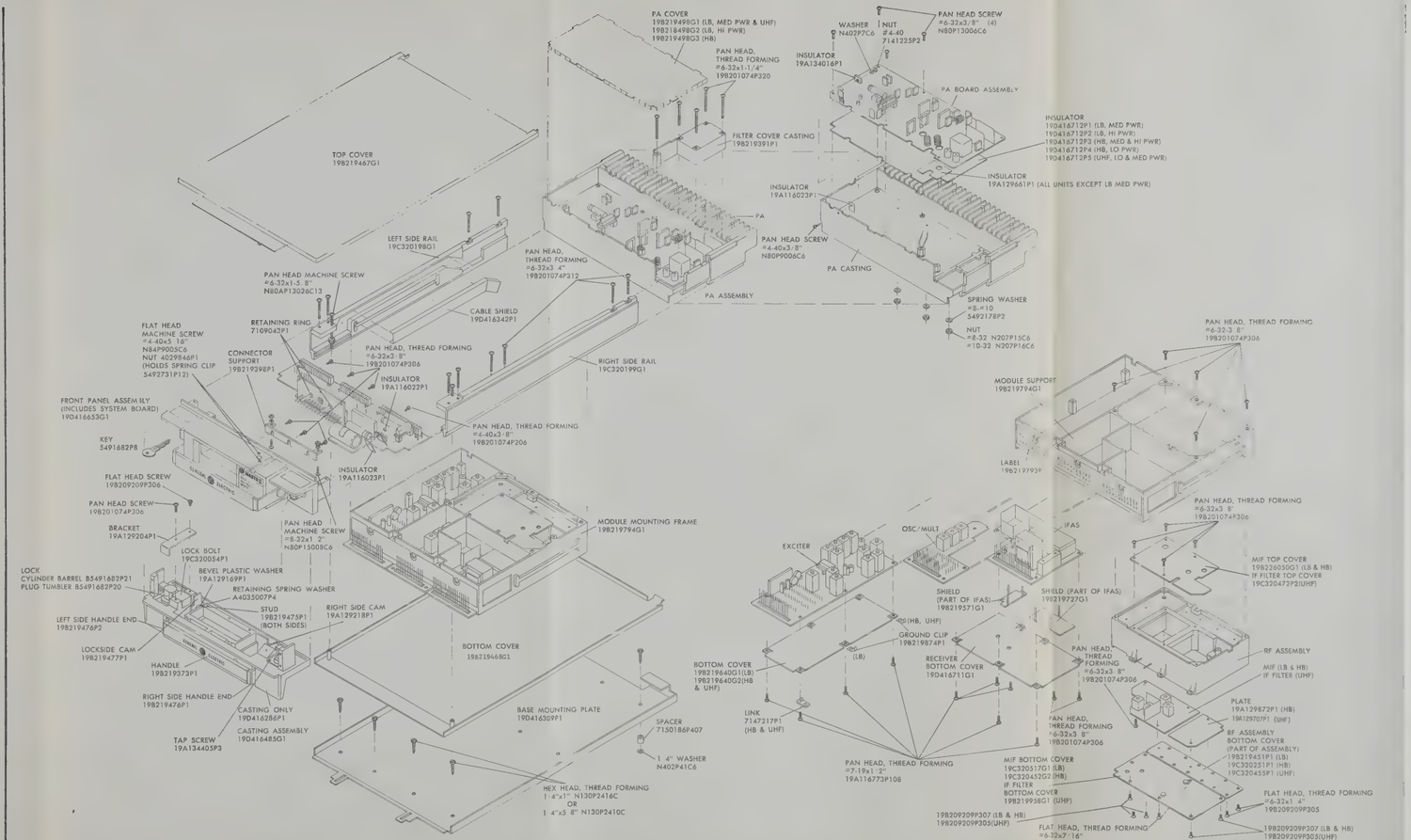




MECHANICAL PARTS BREAKDOWN

UHF TRANSMITTER MODULAR PA ASSEMBLY



MECHANICAL PARTS BREAKDOWN

MASTR II STANDARD COMBINATIONS

INSTALLATION MANUAL FOR MASTR® II MOBILE COMBINATIONS

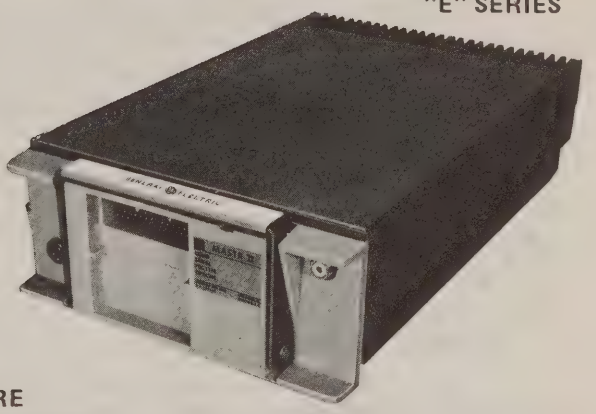
LBI-4444G (DF9031)

MASTR II Mobile Combinations feature ruggedly constructed Two-Way Mobile Radios with unusually flexible mounting possibilities. The Two-Way Radio locks into a steel mounting frame to provide an exceptionally stable mobile installation. Safety Release mounting brackets for the Control Unit and Speaker are provided for the safety of the occupants.

TWO-WAY RADIO

"M" SERIES

"E" SERIES

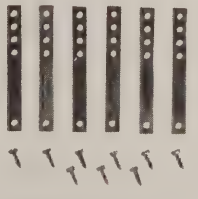


MOUNTING HARDWARE

1/4" x 1"

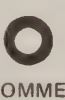
FRAME MOUNTING SCREWS

1/4" x 5/8"

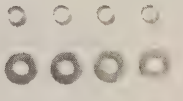


CABLE STRAPS & 6 x 1/2" MOUNTING SCREWS

RETAINING STRAP

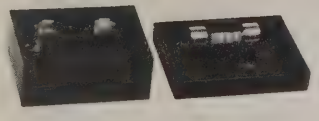


GROMMET



SPACERS & 1/4" WASHERS

ACCESSORIES



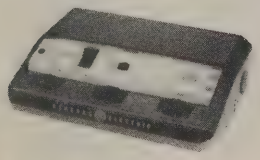
FUSE ASSEMBLY

POWER/CONTROL CABLE

EXTRACTION TOOL

KEY

IGNITION SWITCH ASSEMBLY

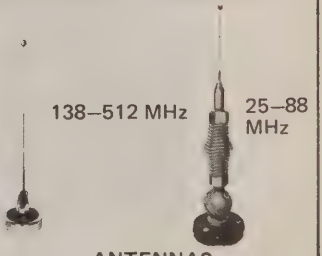


CONTROL UNIT

SPEAKER

MICROPHONE

HANDSET & HOOKSWITCH



ANTENNAS

GENERAL ELECTRIC

UNPACKING AND CHECKING EQUIPMENT

The Two-Way Radio is packed to permit performance tests without being removed from the packing case. Refer to the Maintenance Manual for instructions. When ready for installation, carefully unpack the radio. It is recommended that you identify the items in the packing case and check them off in the appropriate column below before discarding the packing material. If any damage has occurred to the equipment during shipment, file a claim with the carrier immediately.

EQUIPMENT

Two-Way Radio ..... ☐

Control Unit ..... ☐

Speaker 19C320302G1 ..... ☐

Microphone 19C320270G1 ..... ☐

Antenna, Cable and RF Connector ..... ☐
(25—50 MHz
antenna whip shipped
in separate carton)

Fuse Assembly (12-Volt) ..... ☐
High Power (30 Amp Fuse)
(66 to 110 Watts)
19B216021G3

Medium Power (20 Amp Fuse)
(35 to 65 Watts)
19B216021G6

Low Power (15 Amp Fuse)
(to 35 Watts)
19B216021G1

Mounting Frame 19D416309P1 ..... ☐
Mounting Hardware 19A129474G1 ..... ☐

Power/Control Cables ..... ☐
20-Foot, 18 Conductor 19D423424G2
20-Foot, 30 Conductor 19D423424G8
20-Foot, 38 Conductor 19D423424G14

EQUIPMENT

Ignition Switch Cable Assembly ..... ☐
±12 Volts 19B219537G4
DC Converter 19B219537G3

Extractor Tool Kit 19B227456G1 ..... ☐

Microphone Hanger ..... ☐
Standard Bracket 7141414G2
Channel Guard Hookswitch 19C320318G1

Duplex Handset 19C320478G1 ..... ☐
With Hookswitch 19B219846G3

Key: 5491682P8 (BF-10A) ..... ☐

Alignment Tools (2) ..... ☐
19B219676G1
19B219678P1

OPTIONAL EQUIPMENT

Power/Control Cables

9-Foot, 18 Conductor	19D423424G1
9-Foot, 30 Conductor	19D423424G7
9-Foot, 38 Conductor	19D423424G13
27-Foot, 18 Conductor	19D423424G3
27-Foot, 30 Conductor	19D423424G9
27-Foot, 38 Conductor	19D423424G15

Handset 19C320478G1 with
Hookswitch 19B219846G1
±12-Volt, 3-Wire Ignition Switch
Cable Assembly..... 19B219537G1

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PLANNING THE INSTALLATION

The accompanying photographs of typical MASTR II installations should help you in planning your installation. Suggestions for locating and installing the units are given with the following installation instructions.

Before starting, plan your installation carefully—so that it will be:

- Safe for the operator and passengers in the vehicle
- Convenient for the operator to use
- Neat
- Protected from damage from water
- Easy for the serviceman to service
- Out of the way of auto mechanics
- Out of the way of passengers

It is suggested that you take advantage of the experiences of one of the many authorized General Electric Service Stations located throughout the United States by having them install your Two-Way Radio and make the final adjustments.

WARNING

Interference with Vehicular Electronics – *Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical of the types of electronic devices which may be prone to malfunction due to the lack of protection from radio frequency energy present when transmitting. If the vehicle contains such equipment, consult the dealer for the make of vehicle and enlist his aid in determining if such electronic circuits will perform normally when the radio is transmitting.*

TYPICAL INSTALLATION

MASTR II Combinations are designed so that the Two-Way Radio can be mounted up to 20 feet from the operator (9 or 27 feet with option cables), such as in the trunk compartment or under the seat of a vehicle. The Control Unit mounts on the instrument panel (or the transmission hump) of the vehicle, along with the microphone and speaker. A typical installation is shown in Figures 1 and 2.

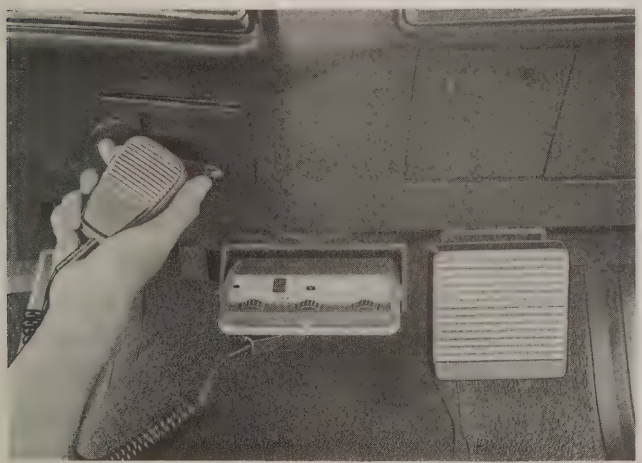


Figure 1 – Control Unit Mounting

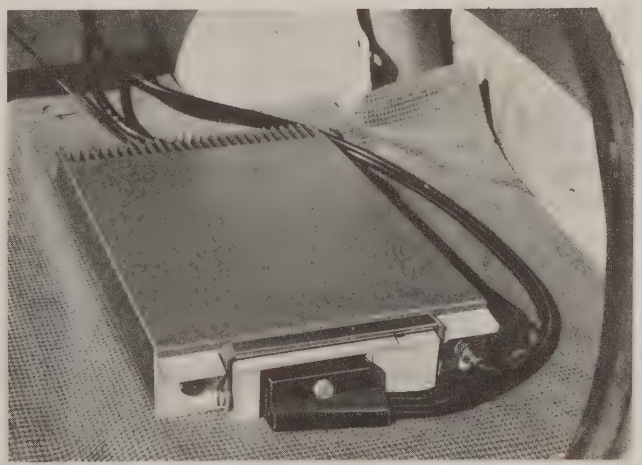


Figure 2 – Two-Way Radio Mounting

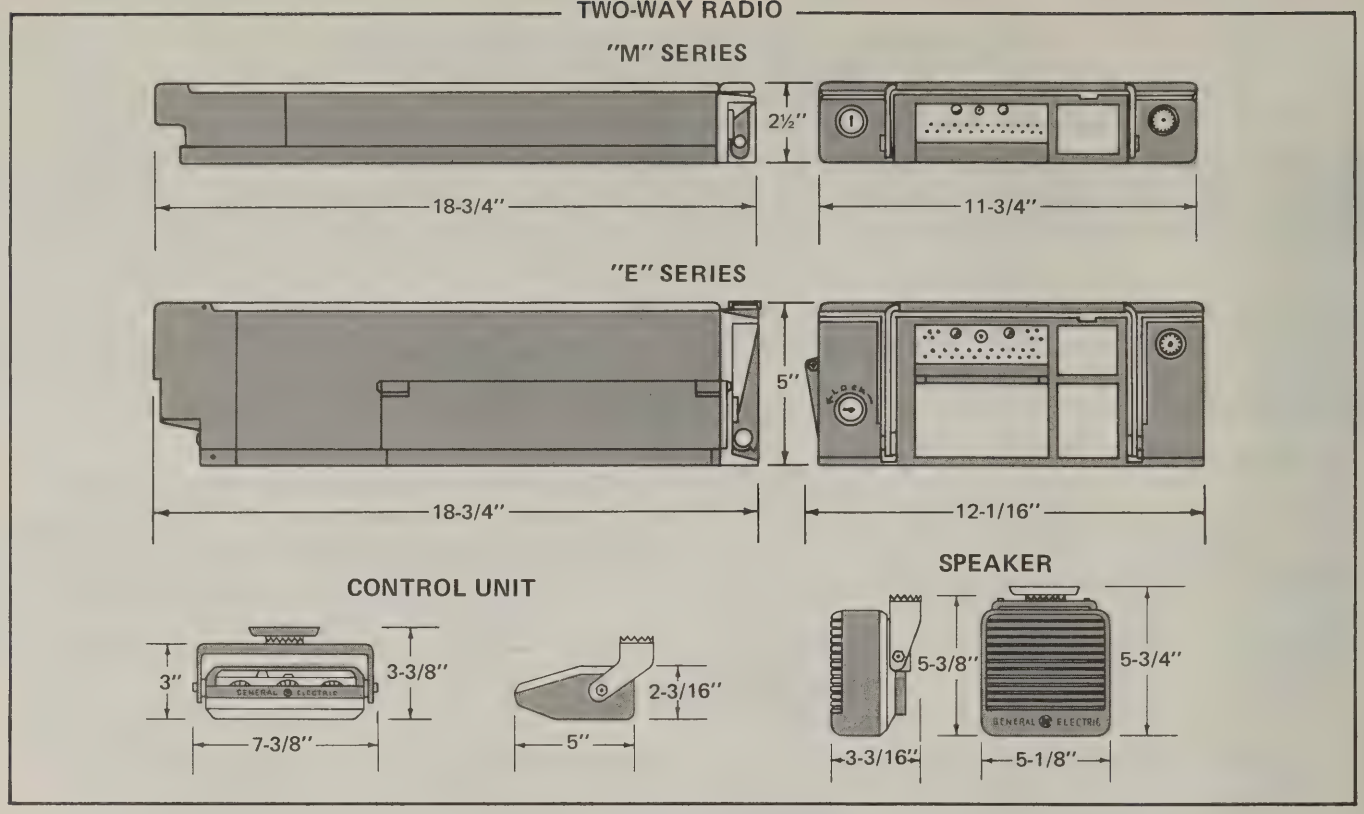


Figure 3. Mounting Dimensions

EQUIPMENT REQUIRED

The equipment required for installing the Two-Way Radio is:

Electric drill for drilling mounting holes.

Drills and circle cutters (see sizes in box at right)

Soldering iron for 138 to 512 MHz antenna

Phillips and flat-blade screwdrivers, 1/4-inch and 5/16-inch hex-head drivers for mounting screws.

DRILL SIZES

- No. 36 (7/64-inch) Drill for No. 6 Self-Tapping Screws
- No. 31 (1/8-inch) Drill for No. 8 Self-Tapping Screws
- No. 27 (9/64-inch) Drill for No. 10 Self-Tapping Screws
- No. 9 (3/16-inch) Drill for 1/4-inch or No. 14 Self-Tapping Screws
- 9/32-inch Drill for Low-Band Antenna and 1/4-inch Bolt
- 3/4-inch Drill for High-Band Antenna
- 1-3/8-inch Circle Cutter, Holesaw or Socket Punch for Low-Band Antenna
- 1-1/8-inch Circle Cutter, Holesaw or Socket Punch for Rubber Grommet

RUNNING CABLES

To assure the feasibility of the cable routings you plan to use, it is suggested that you run the cables before mounting the Two-Way Radio. Be sure to leave some slack in each cable going to the Control Unit and Two-Way Radio so that they may be pulled out for servicing with the power applied.

Try to route the cables away from locations where they will be exposed to heat (exhaust pipes, mufflers, tailpipes, etc.), battery acid, sharp edges, or mechanical damage or where they will be a nuisance to automobile mechanics, the driver, or passengers. Keep wiring away from ignition circuits to help prevent noise pickup in the radio equipment.

In addition, try to utilize existing holes in the firewall and trunk wall and the channels above or beneath the doors. You may also use the channels through door and window columns, where they are convenient for running cables, unless you plan to install rigid or flexible conduit in which to run the cables.

If an existing hole is not conveniently located for the passage of the Power Cable through the firewall, drill a 1-1/8-inch hole and insert the rubber grommet provided. Leave at least 18 inches of slack in the plug end of the cables at the location for the Two-Way Radio. Refer to the Cable Routing Diagram (Figure 4) for additional information.

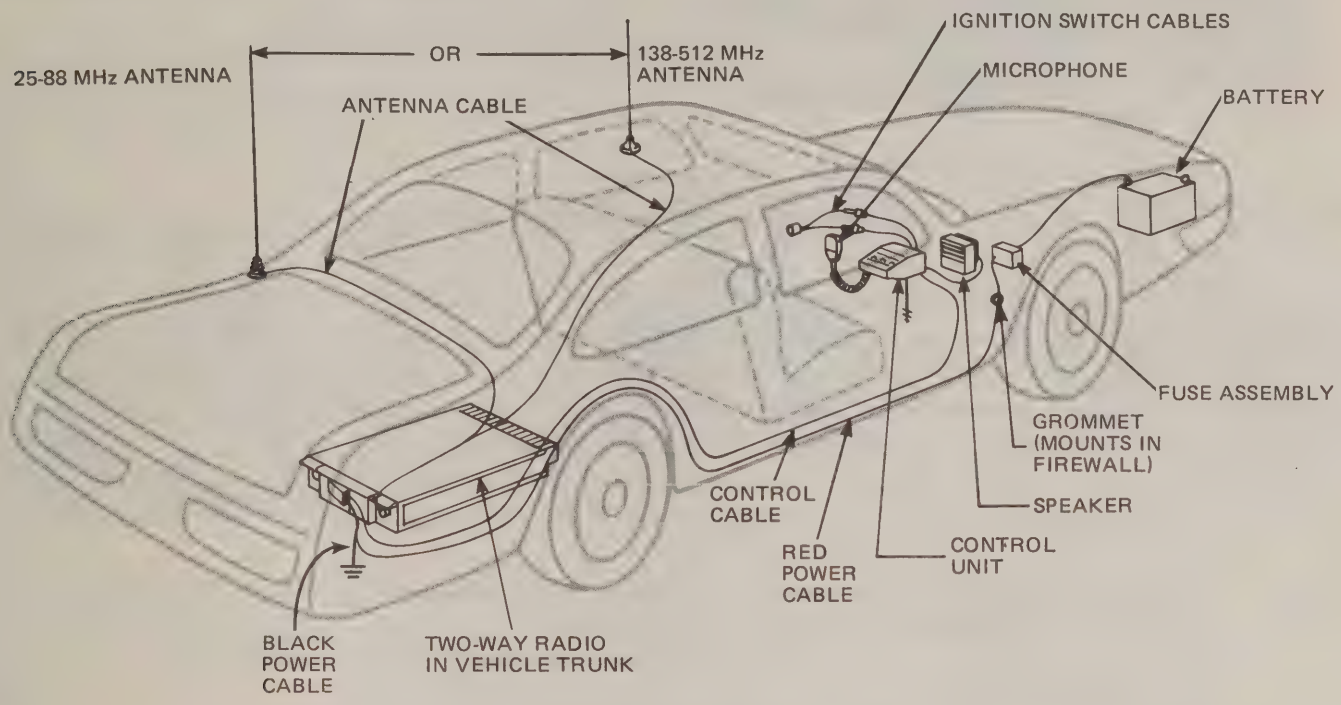


Figure 4. Cable Routing

POWER AND CONTROL CABLES

NOTE

A terminal (19A115799P15) is secured to the power cable for use with batteries that have side terminals. To use the terminal, trim off 1/2 inch of the ridge on the plastic corrosion shield on the battery to allow the terminal to lie flat. Remove the screw in the battery terminal and slide the power cable terminal on the screw. Then replace the screw. Do Not strap the power cable within one foot of the battery terminal.

NEGATIVE GROUND SYSTEMS

1. The Power/Control Cable plug assembly is supplied connected for negative ground systems. Starting with the plug end of the Power/Control Cable, run the black control cable to the control unit location and the red power cable to the vicinity of the battery. Drill a No. 9 (3/16-inch) pilot hole and connect the short black power cable to a good vehicle ground with the 1/4 x 5/8-inch hex-head self-tapping screw and the two external tooth lock washers. The external tooth lock washers are placed on each side of the black power cable ring terminal. Refer to the Cabling Routing Diagram (Figure 4).

POSITIVE GROUND SYSTEMS

2. For positive ground systems, the red and the black power cable terminals must be reversed at the Power/Control Cable plug assembly. Refer to the connector housing and Terminal Identification Diagram (Figure 5) and proceed as follows:

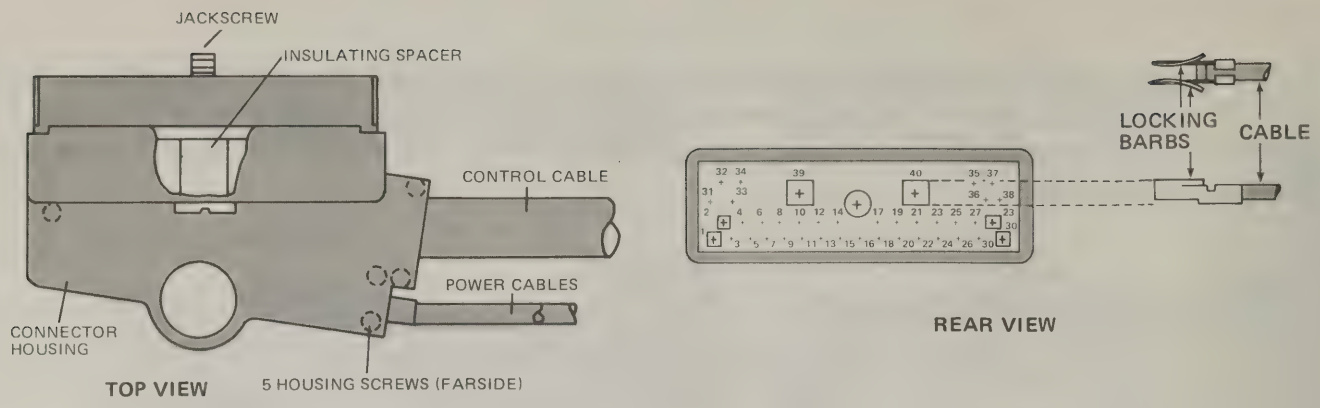


Figure 5. Connector Housing & Terminal Identification

A. Remove the jackscrew and five housing screws from the connector housing.

B. Open the connector housing and remove the insulating spacer.

C. Insert the terminal extractor tool (19B233320G2) in the front of terminal cavity 39 and remove from the rear the red power cable terminal. Remove the black power cable terminal in terminal cavity 40 in the same manner.

D. Insert the red power cable terminal in the rear of terminal cavity 40 and the black power cable terminal in terminal cavity 39. Make sure the terminals are fully seated and locked into the terminal cavity.

E. Partially insert the jackscrew; position the insulating spacer over the jackscrew, and complete the insertion of the jackscrew.

F. Dress the cables into the proper exit locations; close the housing, and replace the five housing screws.

After the terminals are reversed for positive ground systems, run the cables in the same manner as for negative ground systems.

3. Tape the plug(s) and retaining hook and run the Control Cable to the vicinity of the Control Unit. If it is necessary to disassemble the 19-pin plug(s) to run the cable, use the extractor tool as shown in Figure 6. Mark the plugs for identification, and write down the wire colors and hole numbers as the wires are removed from the plug(s).

4. Use the 3-inch cable straps and No. 6 self-tapping screws provided in the Basic Mounting Hardware to secure the cables neatly in place (See Figure 7).

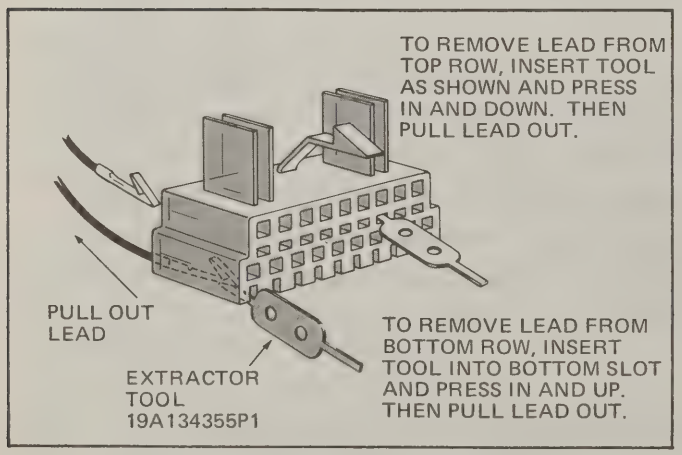

TO REMOVE LEAD FROM TOP ROW, INSERT TOOL AS SHOWN AND PRESS IN AND DOWN. THEN PULL LEAD OUT.
PULL OUT LEAD
EXTRACTOR TOOL 19A134355P1
TO REMOVE LEAD FROM BOTTOM ROW, INSERT TOOL INTO BOTTOM SLOT AND PRESS IN AND UP. THEN PULL LEAD OUT.

Figure 6. Using Extraction Tool

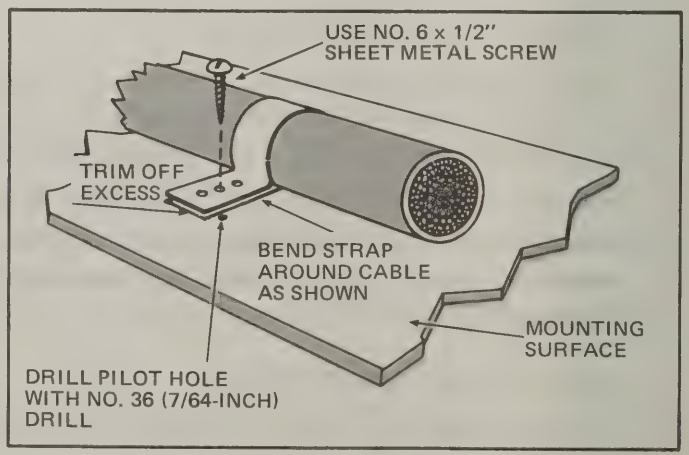

USE NO. 6 x 1/2" SHEET METAL SCREW
TRIM OFF EXCESS
BEND STRAP AROUND CABLE AS SHOWN
MOUNTING SURFACE
DRILL PILOT HOLE WITH NO. 36 (7/64-INCH) DRILL

Figure 7. Installing Cable Straps

FUSE ASSEMBLY

The fuse assembly is mounted near the battery. (See Figure 8). Cut the red power cable and connect to the fuse assembly with the ring terminals and lockwashers provided. Assemble one lockwasher between each terminal and head of each screw. Refer to the Power Cable Connection to Fuse Assembly Diagram (See Figure 9).

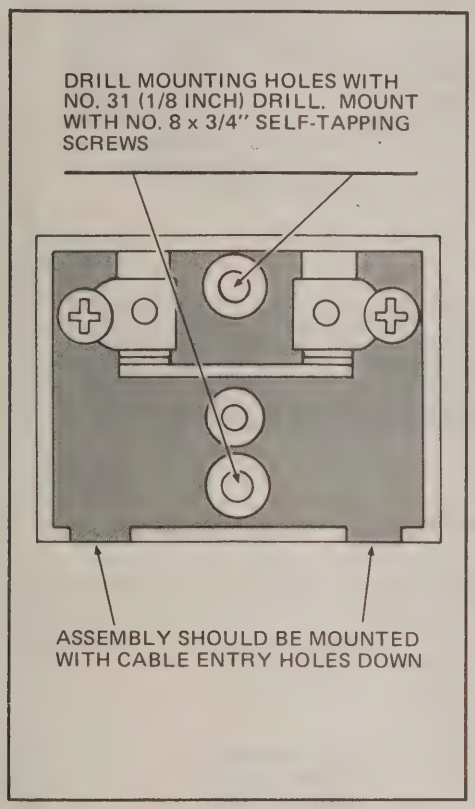

DRILL MOUNTING HOLES WITH NO. 31 (1/8 INCH) DRILL. MOUNT WITH NO. 8 x 3/4" SELF-TAPPING SCREWS
ASSEMBLY SHOULD BE MOUNTED WITH CABLE ENTRY HOLES DOWN

Figure 8. Installation of 12-Volt Fuse Assembly

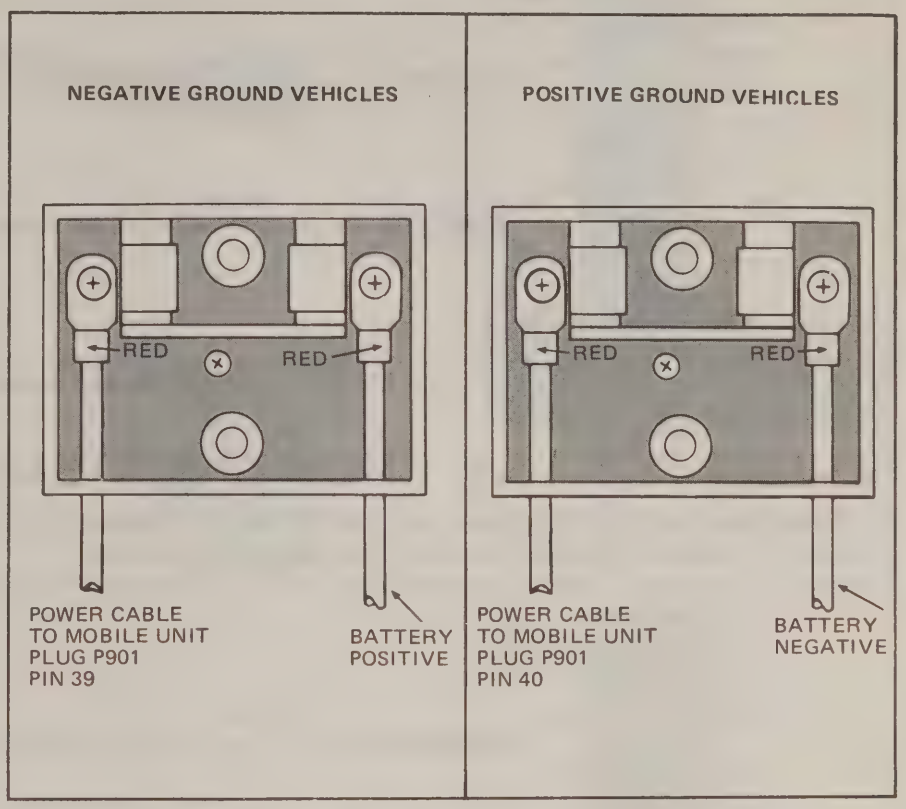


Figure 9. Power Cable Connections to Fuse Assembly

IGNITION SWITCH CABLE ASSEMBLY

In 12-volt vehicle systems, the Ignition Switch Assembly consists of a Yellow "Y" fused lead, a black "Y" lead, and a 19-pin Vehicle Systems Plug. For 12-volt ignition switch connections, refer to Figure 13. In 12-volt vehicles using the optional 3-wire ignition switch cable assembly, refer to pages 14 and 15.

For radios using the DC Converter, the Ignition Switch Assembly consists of a Red fused lead, a jumper and a 19-pin Vehicle Systems Plug. The Red fused lead *always* connects to battery positive in either positive or negative ground systems.

In-line connectors are provided for shortening the fused leads, if desired. If the in-line connectors are used, install the connectors between the fuse and the Vehicle Systems Plug.

NOTE

The speaker connections and other option connections (hookswitches, etc.) are also made to the Systems Plug. Do not connect the Systems Plug to the Control Unit until all connections have been made.

12-VOLT NEGATIVE GROUND SYSTEMS

The Ignition Switch Assembly is shipped from the factory connected for negative ground systems as shown in Figure 10.

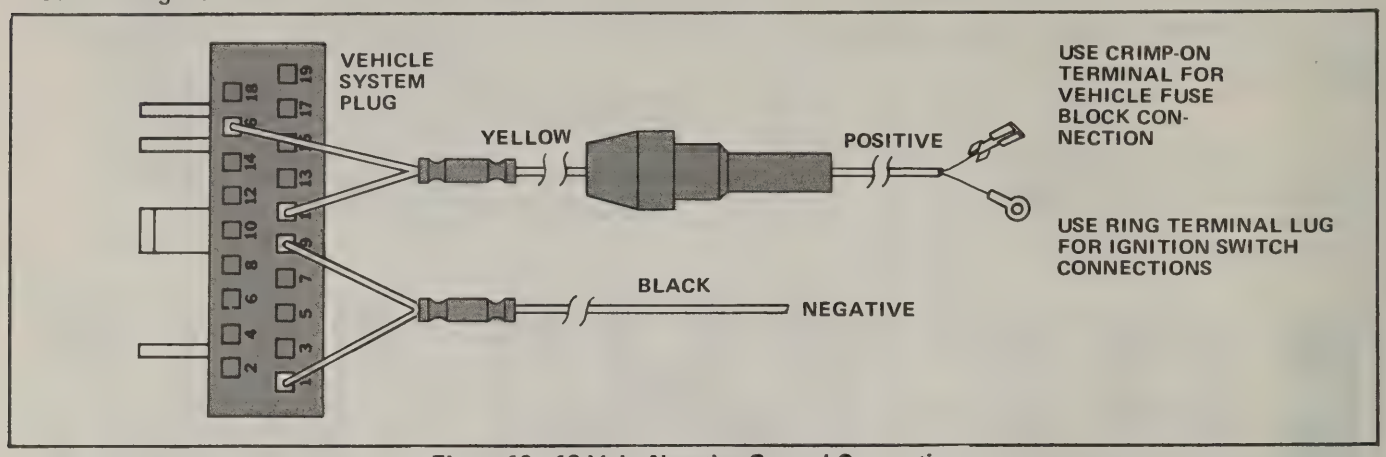


Figure 10. 12-Volt, Negative Ground Connections

12-VOLT POSITIVE GROUND SYSTEMS

For 12-volt, positive ground systems, the connections to the Vehicle Systems Plug must be changed as shown in Figure 11. Use the extractor tool for changing the connections.

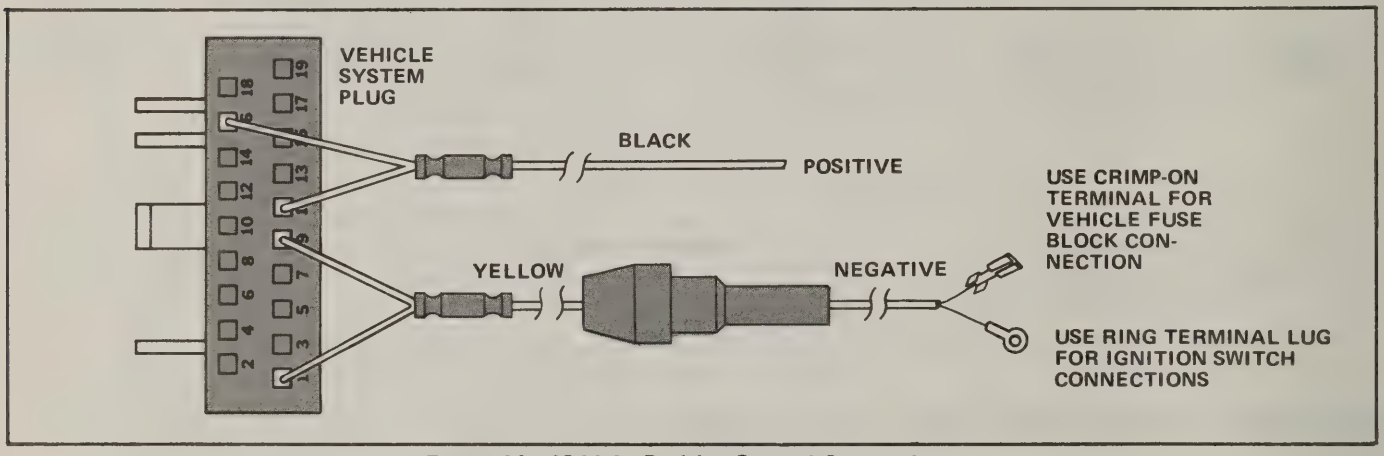


Figure 11. 12-Volt, Positive Ground Connections

DC CONVERTER SYSTEMS (+OR-GROUND)

For radios equipped with the DC converter, connections to the Vehicle Systems Plug are shown in Figure 12.

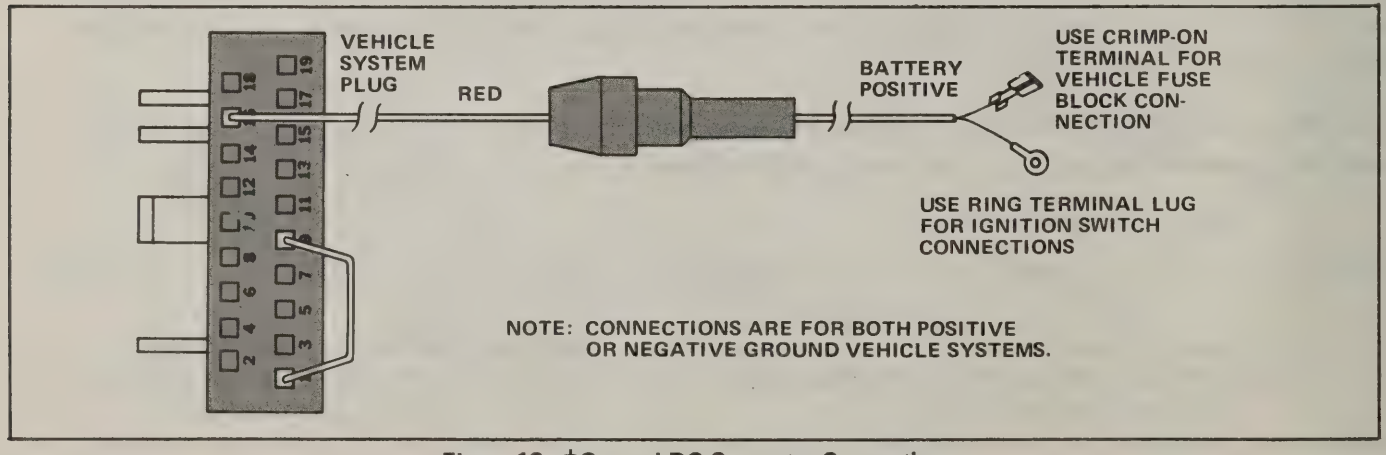
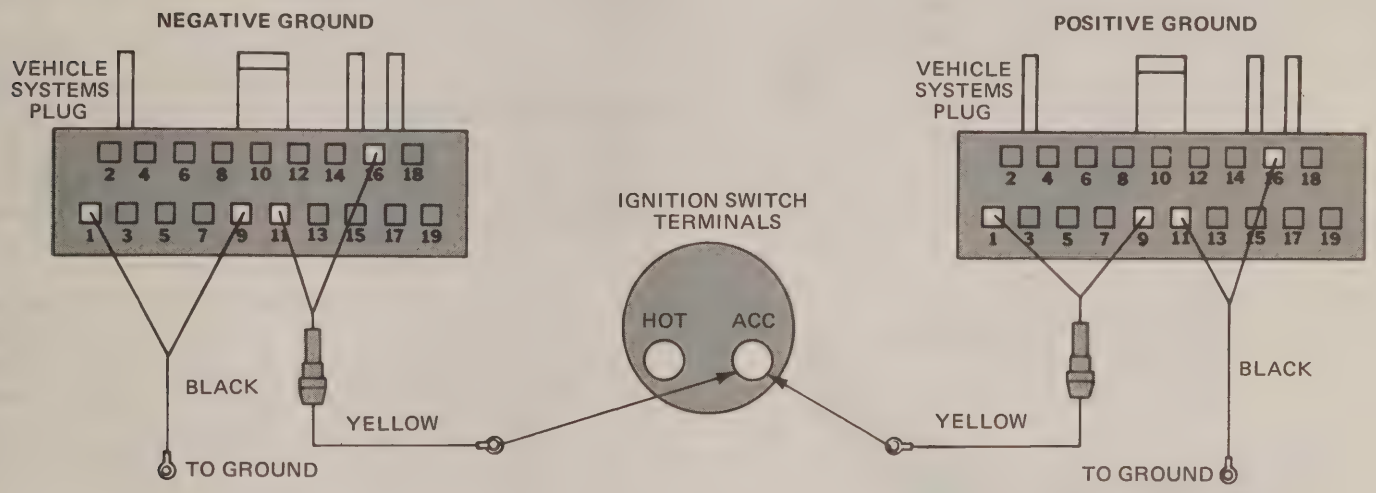

VEHICLE SYSTEM PLUG
RED
BATTERY POSITIVE
USE CRIMP-ON TERMINAL FOR VEHICLE FUSE BLOCK CON-NECTION
USE RING TERMINAL LUG FOR IGNITION SWITCH CONNECTIONS
NOTE: CONNECTIONS ARE FOR BOTH POSITIVE OR NEGATIVE GROUND VEHICLE SYSTEMS.

Figure 12. ±Ground DC Converter Connections

Power to the radio can be controlled by one of two methods shown here. Select the type of control desired, and connect the Ignition Switch cables as directed.

1 **IGNITION SWITCH CONTROL**

Transmitter and receiver will operate only with ignition switch in ACCESSORY or ON position. Turning ignition switch OFF removes all power to the radio.



2 **IGNITION SWITCH BYPASS**

Transmitter and receiver operate independently of ignition switch. Unit can be turned ON and OFF only by Control Unit switch.

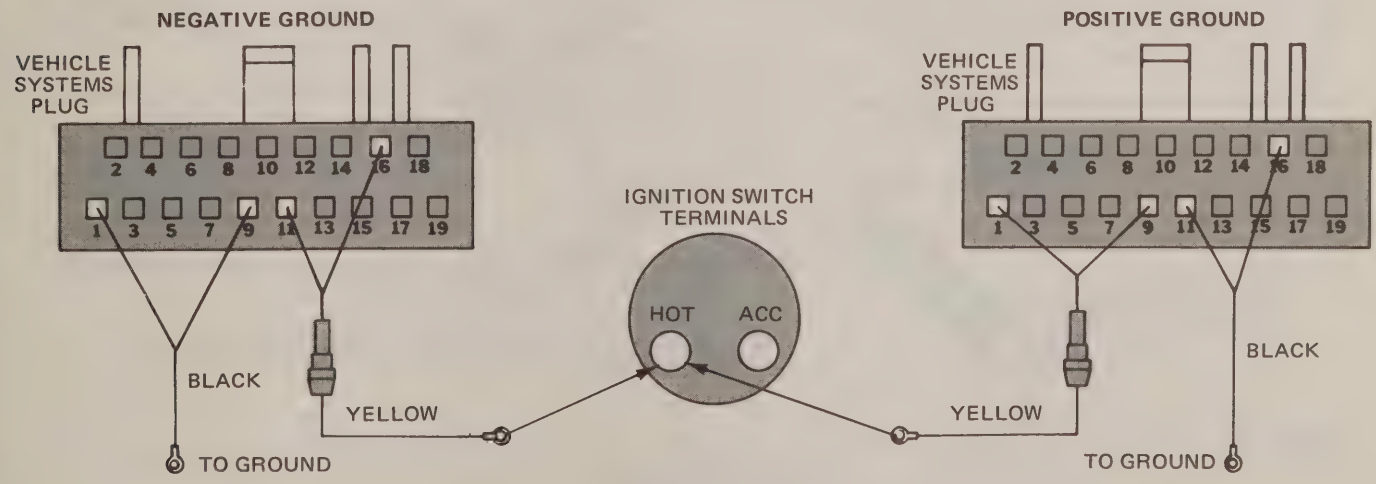


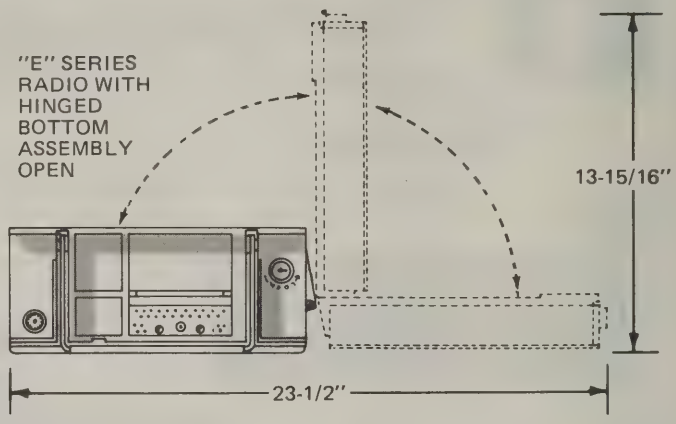
Figure 13. Connections for 12-Volt Ignition Switch Cables

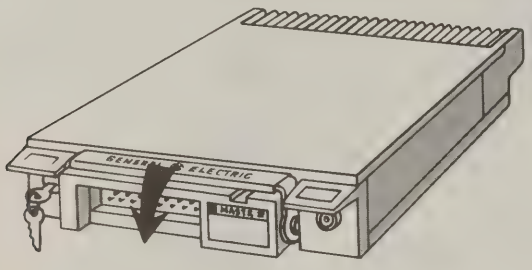
TWO-WAY RADIO

The Two-Way Radio may be mounted horizontally, vertically or on its side. Select a mounting location with sufficient room for the radio to be pulled out of the mounting frame for servicing. Mount the Two-Way Radio as shown in Figure 14.

WARNING

For passenger safety, mount the radio securely so that the unit will not break loose in the event of a collision. This is especially important in station wagons, vans and similar type installations where a loose radio could be extremely dangerous to the vehicle occupants.





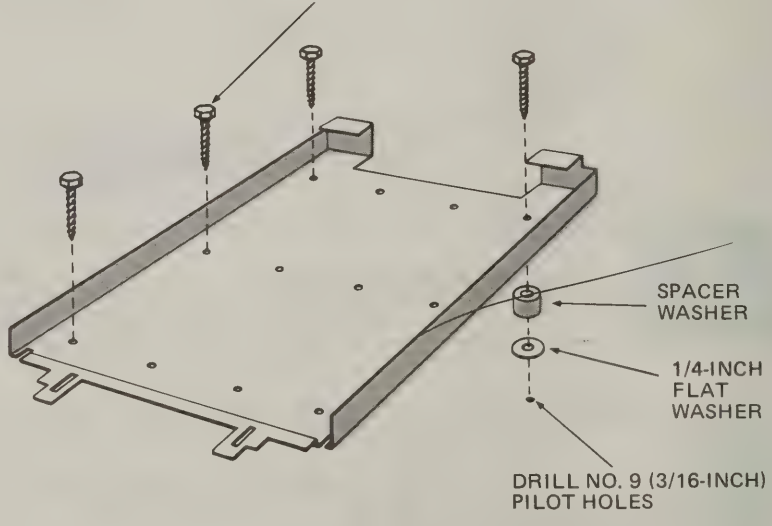
① TO REMOVE RADIO FROM MOUNTING FRAME, UNLOCK RADIO AND PULL HANDLE DOWN AS SHOWN. THEN PULL RADIO FORWARD OUT OF FRAME.

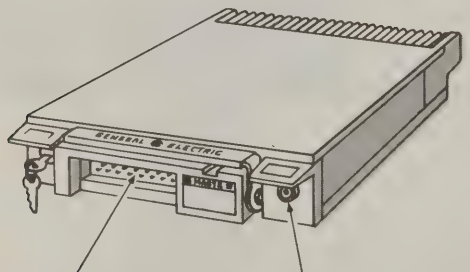
CAUTION

Be careful to avoid damaging some vital part of the vehicle when drilling mounting holes. Always check to see how far the mounting screws will extend below the mounting surface before installing.

② MOUNT FRAME WITH NO. 14 x 5/8-INCH HEX-HEAD SELF-TAPPING SCREWS. (USE 1-INCH SCREWS IF NEEDED).

USE 1/4-INCH FLAT WASHERS (AND SPACER WASHERS IF REQUIRED) TO LEVEL RADIO. WHEN NECESSARY, USE SPACER WASHERS TO PREVENT MOUNTING SCREWS FROM PENETRATING GAS TANK, GAS LINES, ETC.





③ REPLACE RADIO IN MOUNTING BRACKET. PUSH UP HANDLE TO SECURE IN FRAME AND LOCK RADIO.

④ CONNECT THE POWER/CONTROL CABLE AND ANTENNA CABLE TO THE JACKS

Figure 14. Installing the Two-Way Radio

CONTROL UNIT

The Control Unit should be mounted within convenient reach of the operator, and where it will not interfere with the safe operation of the vehicle of provide a hazard to the vehicle passengers in case of an accident. *Use the Safety Release mounting brackets for passenger safety whenever the mounting location requires, or where the swivel action is desired.*

Use the mounting bracket as a template for locating the mounting holes, and mount the Control Unit as shown in Figure 15. After mounting the unit, connect the control cable plug(s). Do not attach the Vehicle Systems Plug until the speaker connections and other optional connections (hookswitches, etc.) have been made.

After making all connections to the Vehicle Systems Plug, connect the Control Cable and the Vehicle Systems Plug to the control unit as shown in Figure 16. Attach the retaining strap as shown to provide strain relief for connections to the Vehicle Systems Plug.

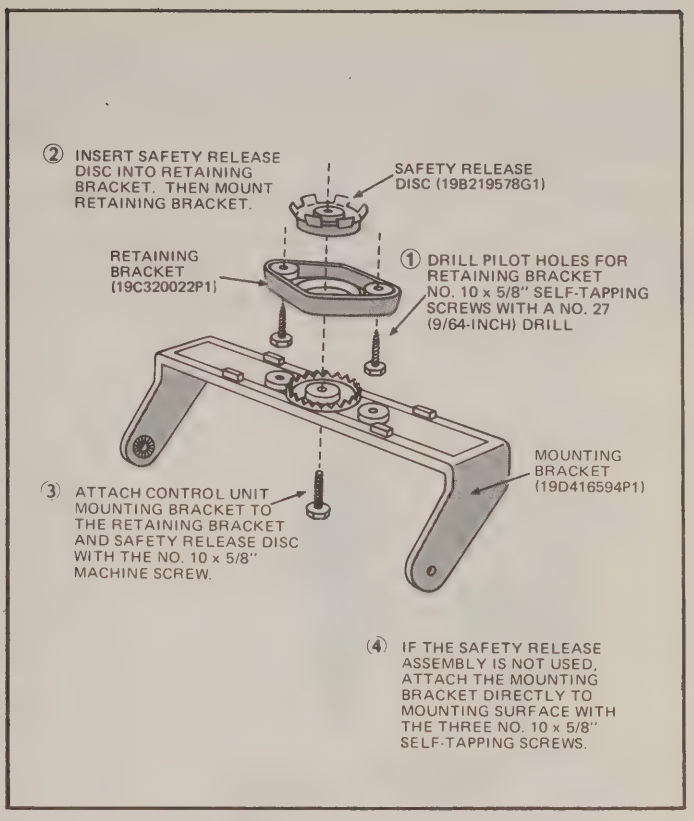

② INSERT SAFETY RELEASE DISC INTO RETAINING BRACKET. THEN MOUNT RETAINING BRACKET.
SAFETY RELEASE DISC (19B219578G1)
RETAINING BRACKET (19C320022P1)
① DRILL PILOT HOLES FOR RETAINING BRACKET NO. 10 x 5/8" SELF-TAPPING SCREWS WITH A NO. 27 (9/64-INCH) DRILL
MOUNTING BRACKET (19D416594P1)
③ ATTACH CONTROL UNIT MOUNTING BRACKET TO THE RETAINING BRACKET AND SAFETY RELEASE DISC WITH THE NO. 10 x 5/8" MACHINE SCREW.
④ IF THE SAFETY RELEASE ASSEMBLY IS NOT USED, ATTACH THE MOUNTING BRACKET DIRECTLY TO MOUNTING SURFACE WITH THE THREE NO. 10 x 5/8" SELF-TAPPING SCREWS.

Figure 15. Mounting the Control Unit

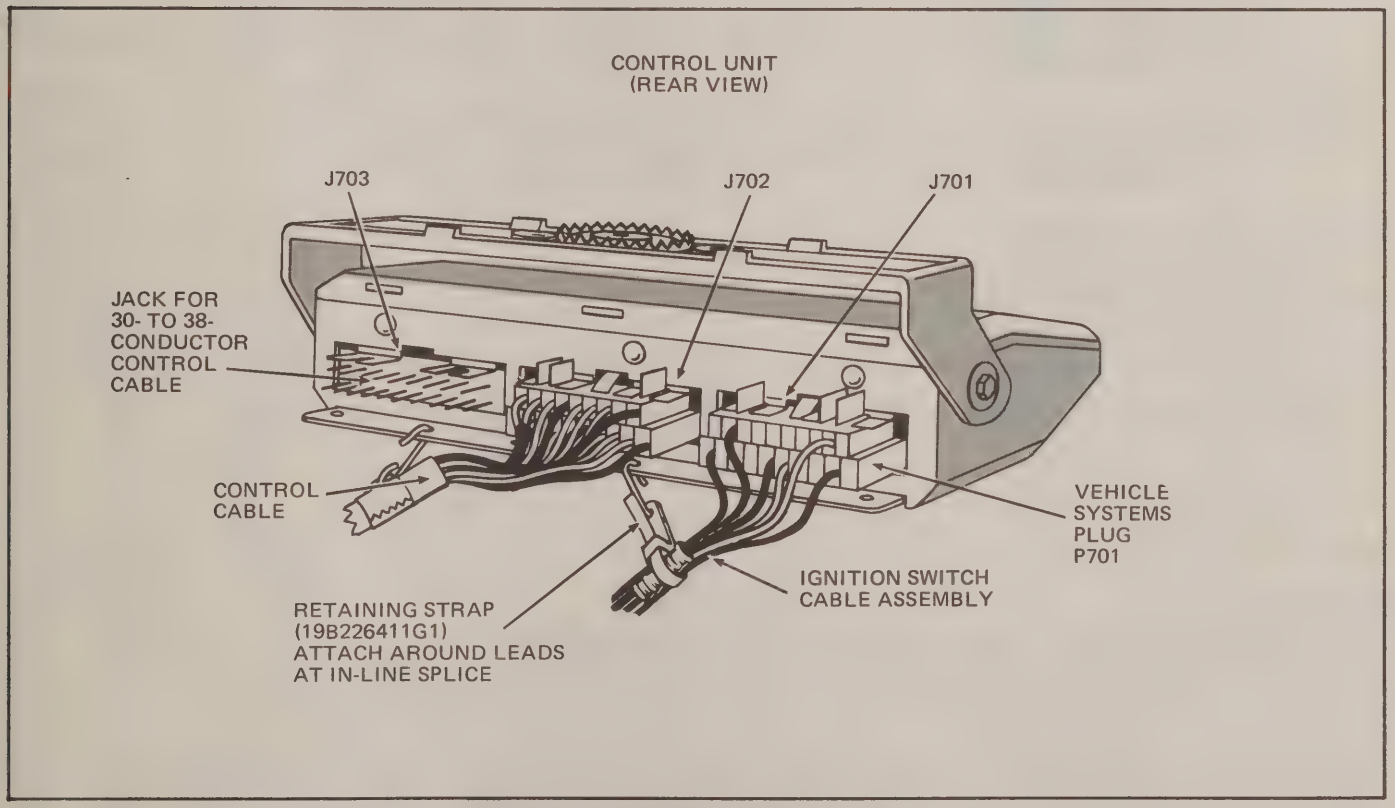


Figure 16. Installing Retaining Strap

MICROPHONE

Mount the microphone where it will be within easy reach of the operator, but will not interfere with safe operation of the vehicle. Two mounting holes are provided in the bottom of the Control Unit for mounting the standard microphone bracket if desired. After the microphone bracket is mounted, connect the microphone plug into the microphone jack on the bottom of the Control Unit, and tighten the retaining screw in the plug.

If the bracket is not mounted on the Control Unit, refer to Figure 17 for mounting instructions.

Two bosses are provided on the inside of the top cover of the Control Unit that can be drilled out (No. 31 drill) for mounting the standard bracket on the top. To remove the Control Unit cover, remove the two screws on the bottom of the front edge. Use the two No. 7 x 5/16-inch screws for mounting the microphone bracket on the Control Unit.

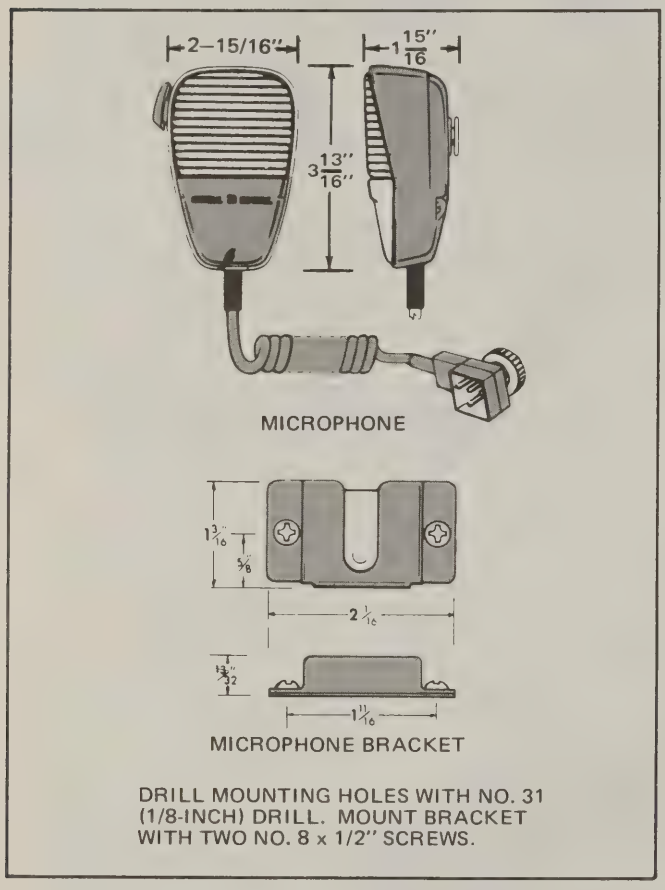


Figure 17. Microphone Bracket Mounting

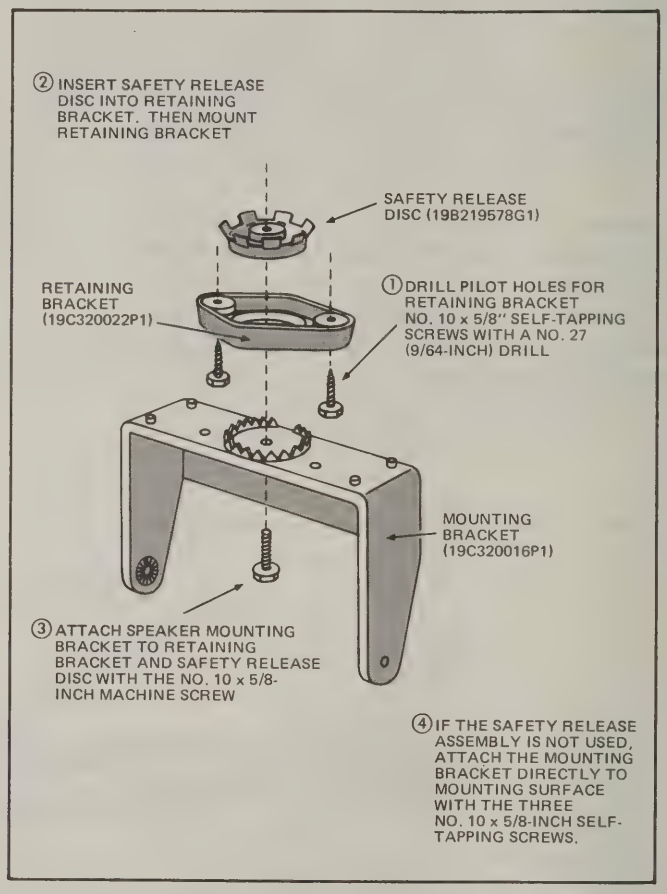

② INSERT SAFETY RELEASE DISC INTO RETAINING BRACKET. THEN MOUNT RETAINING BRACKET
SAFETY RELEASE DISC (19B219578G1)
RETAINING BRACKET (19C320022P1)
① DRILL PILOT HOLES FOR RETAINING BRACKET NO. 10 x 5/8" SELF-TAPPING SCREWS WITH A NO. 27 (9/64-INCH) DRILL
MOUNTING BRACKET (19C320016P1)
③ ATTACH SPEAKER MOUNTING BRACKET TO RETAINING BRACKET AND SAFETY RELEASE DISC WITH THE NO. 10 x 5/8-INCH MACHINE SCREW
④ IF THE SAFETY RELEASE ASSEMBLY IS NOT USED, ATTACH THE MOUNTING BRACKET DIRECTLY TO MOUNTING SURFACE WITH THE THREE NO. 10 x 5/8-INCH SELF-TAPPING SCREWS.

Figure 18. Mounting the Speaker

SPEAKER

The speaker should be mounted where it will direct sound to the operator, but not interfere with his vision or provide a hazard to passengers in case of an accident. *Use the Safety Release mounting brackets for passenger safety whenever the mounting location requires, or where the swivel action is desired.*

The speaker may be mounted on the lower edge of the instrument plane, on the firewall, above the windshield in some trucks, or behind the built-in speaker grille in some vehicles. Use the mounting bracket as a template for locating the mounting holes, and mount the speaker as shown in Figure 18. If the speaker has been disconnected, connect the two pins to holes 4 and 17 on the Vehicle Systems Plug.

CHANNEL GUARD HOOKSWITCH

For Channel Guard with Automatic Monitoring applications, a hookswitch is used in place of the microphone bracket. Mount the hookswitch as shown in Figure 19. After mounting the hookswitch, connect the two pins to holes 10 and 14 on the Vehicle Systems Plug if the hookswitch has been disconnected.

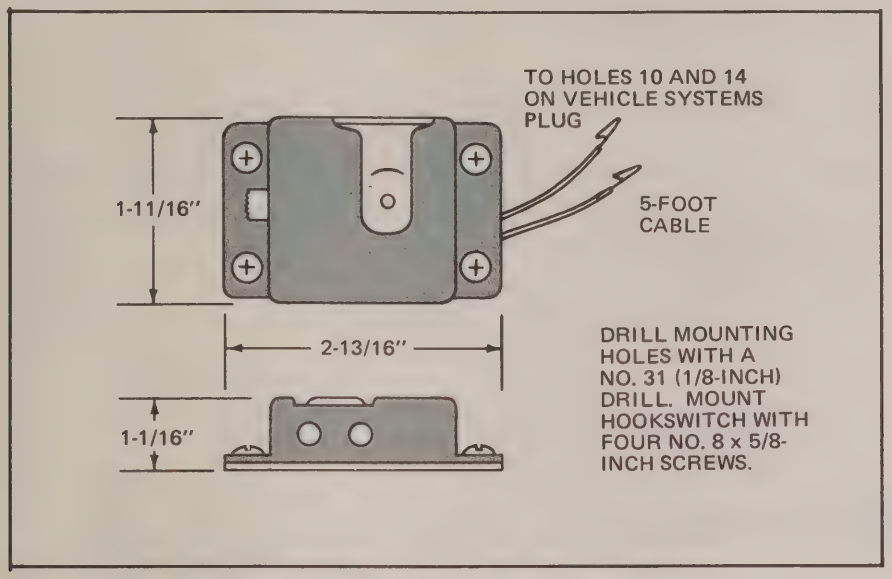

TO HOLES 10 AND 14 ON VEHICLE SYSTEMS PLUG
5-FOOT CABLE
1-11/16"
2-13/16"
1-1/16"
DRILL MOUNTING HOLES WITH A NO. 31 (1/8-INCH) DRILL. MOUNT HOOKSWITCH WITH FOUR NO. 8 x 5/8-INCH SCREWS.

Figure 19. Hookswitch Mounting

NOTE

The Channel Guard Microphone hookswitch cannot be mounted in the holes provided on the Control Unit.

HANDSET AND HANDSET HOOKSWITCH (OPTIONAL)

Mount the handset hookswitch as shown in Figure 20. After mounting the handset hookswitch, connect the handset plug to the microphone jack on the bottom of the Control Unit. If the hookswitch has been disconnected, connect the hookswitch cable to the Vehicle Systems Plug as shown in Figure 20.

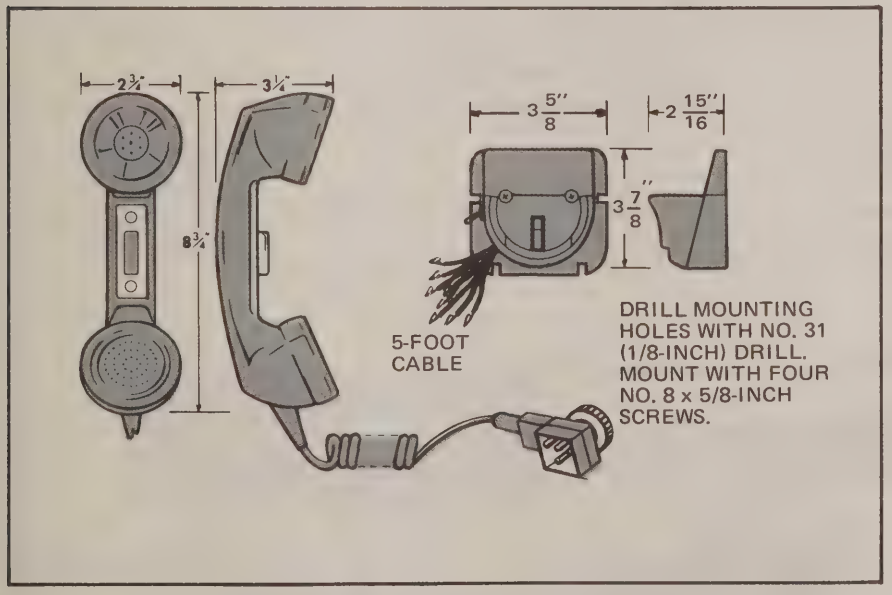


Figure 20. Handset Hookswitch Mounting

WIRE COLOR	CONNECT TO SYSTEMS PLUG
Blue	J701 - 13
Green	J701 - 2
Orange	J701 - 15
Black	J701 - 14
Brown	J701 - 18
Red	J701 - 10

Figure 21.
Connections for Handset Hookswitch

3-WIRE IGNITION SWITCH CABLE ASSEMBLY (OPTIONAL)

The optional ±12-Volt, 3-Wire Ignition Switch Assembly consists of a Red and a Yellow fused lead, a "Y" black ground lead, and a 19-pin Vehicle Systems Plug. For ignition switch connections, refer to Figure 24.

12-VOLT NEGATIVE GROUND SYSTEMS

The Ignition Switch Assembly is shipped from the factory connected for negative ground systems as shown in Figure 22. In-line connectors are provided for shortening the fused leads, if desired. If the in-line connectors are used, install the connectors between the fuse and the Vehicle Systems Plug.

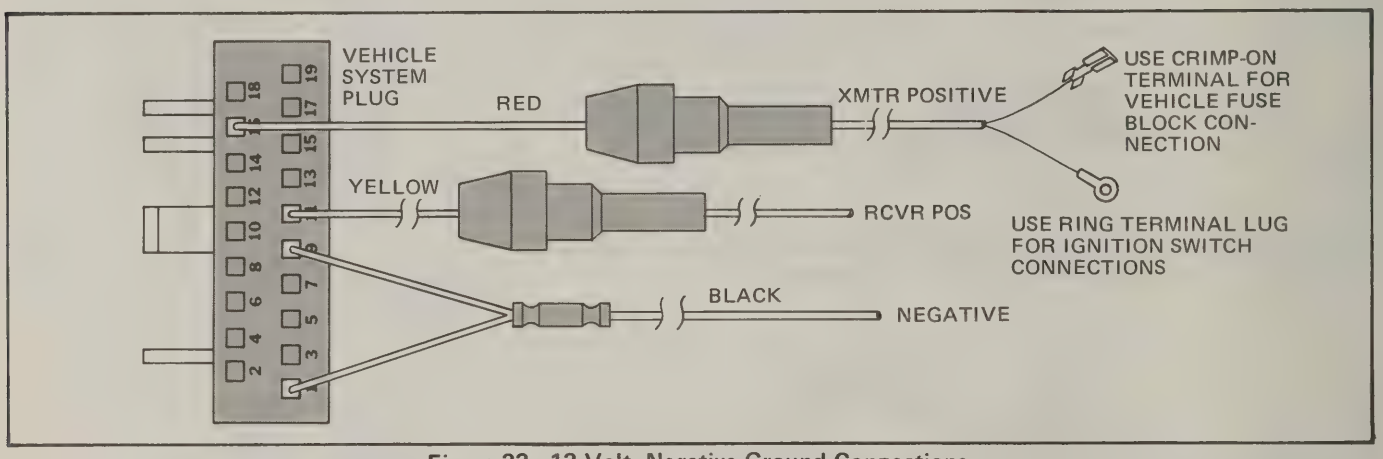


Figure 22. 12-Volt, Negative Ground Connections

12-VOLT POSITIVE GROUND SYSTEMS

For 12-volt, positive ground systems, the connections to the vehicle Systems Plug must be changed as shown in Figure 23. Use the extractor tool for changing the connections. In-line connectors are provided for shortening the fused leads, if desired. If the in-line connectors are used, install the connectors between the fuse and the Vehicle Systems Plug.

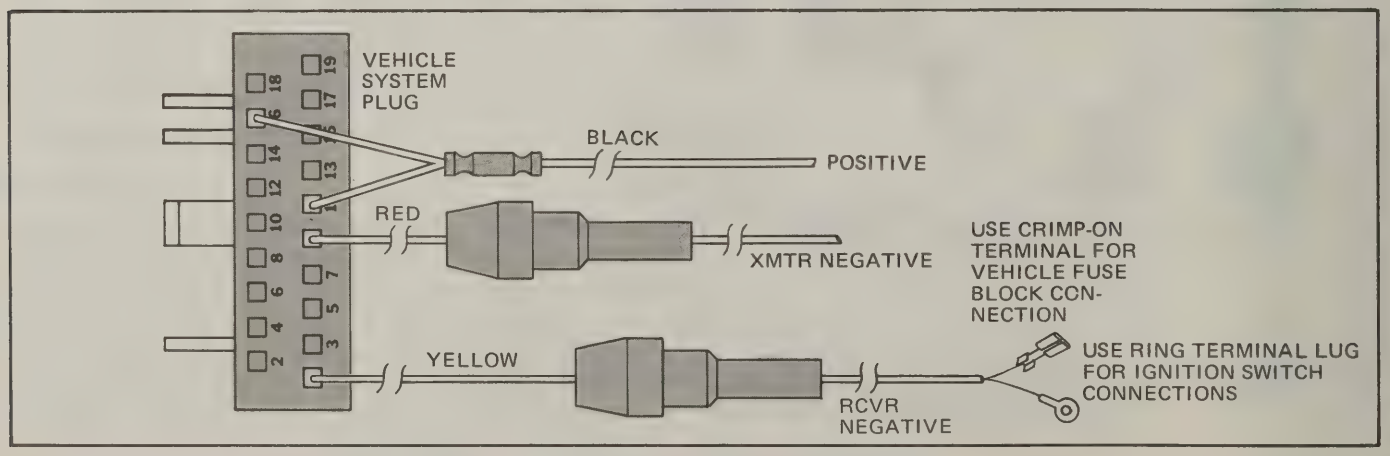
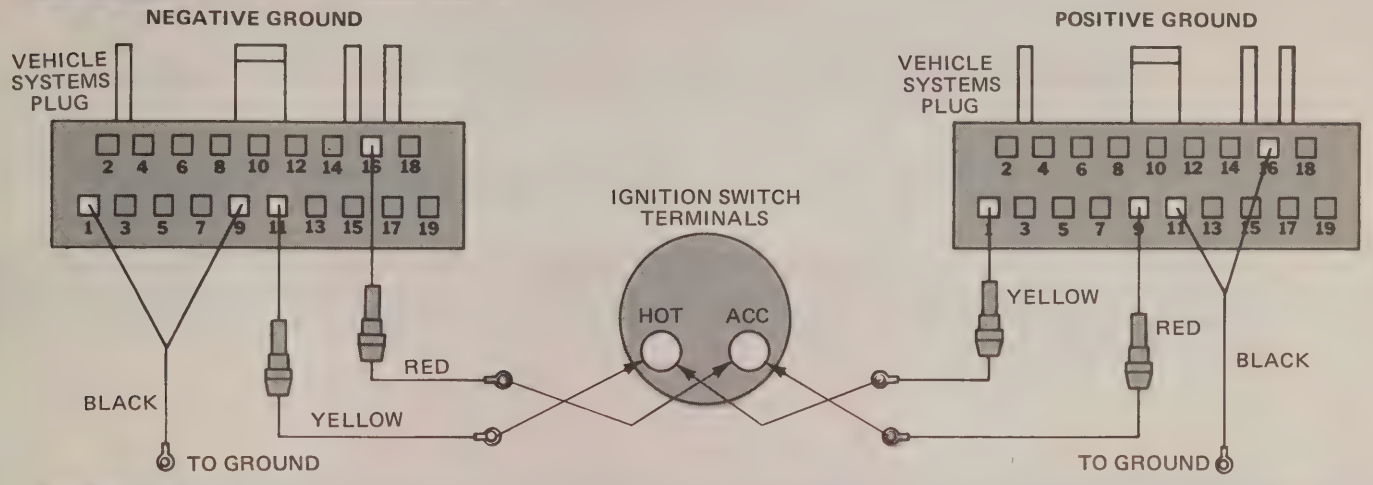


Figure 23. 12-Volt, Positive Ground Connections

Power to the radio can be controlled by one of the three methods described below. Select the type of control desired, and connect the Ignition Switch cables as directed.

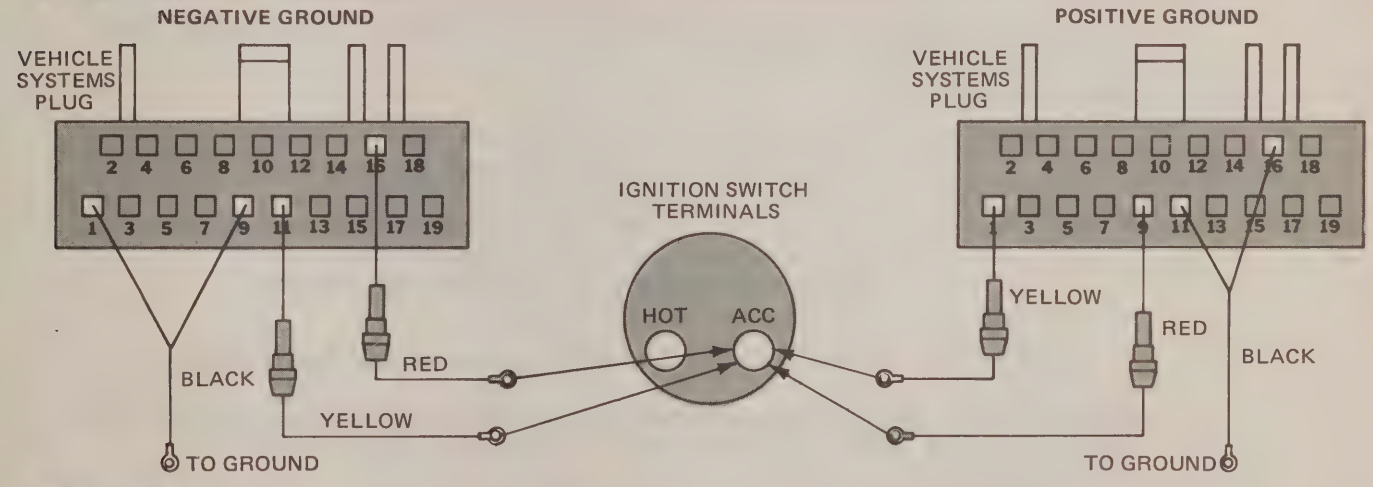
1 IGNITION SWITCH STANDBY

Receiver will operate independently of ignition switch. Transmitter will operate only with ignition switch in ACCESSORY or ON position.



2 IGNITION SWITCH CONTROL

Transmitter and receiver will operate only with ignition switch in ACCESSORY or ON position. Turning ignition switch OFF removes all power to the radio.



3 IGNITION SWITCH BYPASS

Transmitter and receiver operate independently of ignition switch. Unit can be turned ON and OFF only by Control Unit switch.

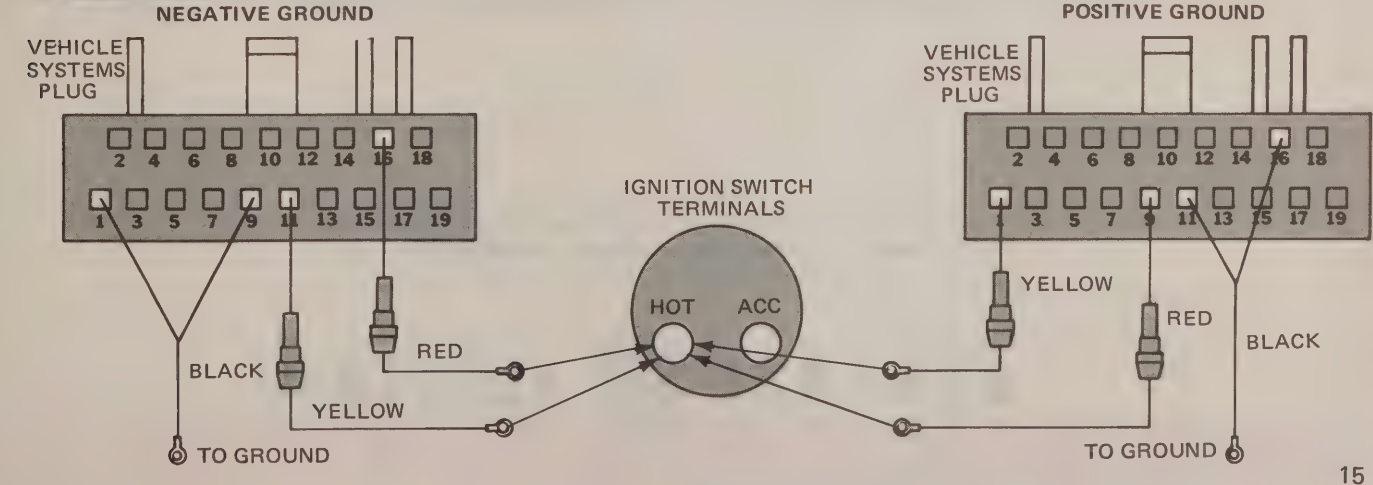


Figure 24. Connections for 12-Volt Ignition Switch Cables

ANTENNA

Installation instructions for the antenna are packaged with the antenna. The antenna must be installed in accordance with good engineering practice for optimum results.

For the 138–512 MHz antenna, the most effective mounting position is usually in the center of the roof of the vehicle. The antenna cable will normally run from the front of the Two-Way Radio, behind sections of the interior trim to a door or window post, and then up between the roof and headliner in the passenger compartment to the antenna base.

For the 25–88 MHz antenna, the most effective mounting position is usually on the driver's side of the vehicle near the top of the left rear fender or body of the vehicle.

Try to route the cable away from locations where it will be exposed to heat, sharp edges or mechanical damage, and where it will be out of the way of the driver, passengers or vehicle mechanics. Wherever possible, existing holes in the trunk wall, and the channels above or beneath doors and window columns should be utilized.

PLACING THE TWO-WAY RADIO IN OPERATION

After completing the installation of the Two-Way Radio, the following final operations should be performed:

Have an electronics technician who holds a 1st or 2nd Class FCC Radiotelephone license make the final adjustments.

These include:

Transmitter:	Measure Forward and Reflected Power and adjust antenna length for optimum ratio. Set transmitter to rated power output (or to the specific output or input that may be required by the FCC station authorization). Measure the frequency and modulation and enter these measurements on the FCC-required Station Records.
Vehicle:	Check to see if any electrical noise suppression is needed.

Instructions for making these adjustments are included in the Maintenance Manual for the Two-Way Radio. Give the alignment tools (packed with the unit) to the technician.

Fill out and mail the "ON ARRIVAL" Information Card.

Give the Operator's Manual for the Two-Way Radio to the person who is going to operate it, or place the Manual in the vehicle where he will find it.

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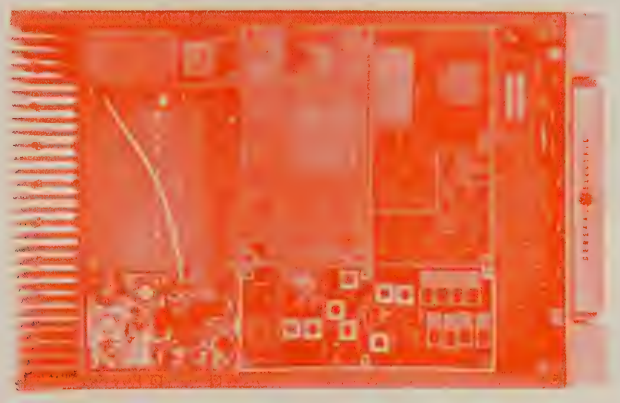
MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

406-512 MHz, 40-WATT TRANSMITTER-MOBILE AND STATION



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EXCITER	LBI30200 (DF3165)
POWER AMPLIFIER	LBI30213 (DF3174)

GENERAL ELECTRIC

Maintenance Manual LBI30211C

(DF3158, THIS SHEET ONLY)

406-512 MHz EXCITER 19D423865G2,4
40-WATT PA ASSEMBLY 19D424888G5-8, G22-25, G35, G36
& 19D424895G5-8, G22-25, G36, G37

SPECIFICATIONS*

Power Output	
406-420 MHz, 450-494 MHz	40 Watts (Adjustable from 12 to 40 Watts)
440-450 MHz	30 Watts (Adjustable from 12 to 30 Watts)
420-440 MHz, 494-512 MHz	35 Watts (Adjustable from 12 to 35 Watts)
Crystal Multiplication Factor	36
Frequency Stability	
5C-ICOM with EC-ICOM	±0.0005% (-40°C to +70°C)
5C-ICOM or EC-ICOM	±0.0002% (0°C to +55°C)
2C-ICOMS	±0.0002% (-40°C to +70°C)
Spurious and Harmonic Emission	At least 85 dB below full rated power output.
Modulation	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting.
Modulation Sensitivity	75 to 120 Millivolts (Mobile) 10 to 120 Millivolts (Station)
Audio Frequency Characteristics	Within +1 dB to -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA.
Distortion	Less than 2% @ 1000 Hz Less than 5% @ 300 Hz Less than 3% @ 3000 Hz
Deviation Symmetry	0.6 kHz maximum

Maximum Frequency Spread	**Full Specifications**	**1 dB Degradation**
406-470 MHz	5.50 MHz	9.00 MHz
470-494 MHz	5.80 MHz	9.50 MHz
494-512 MHz	6.00 MHz	9.75 MHz

Duty Cycle	EIA 20% Intermittent (Mobile and Stations) Continuous (Stations)
RF Output Impedance	50 Ohms

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specifivation Sheet for the complete specifications.

WARNING

Although the highest DC voltage supplied to the MASTR II transmitter is +12 Volts DC, high current may be drawn under short circuit conditions. These currents can possibly heat objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

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DESCRIPTION AND MAINTENANCE

406—512 MHz, 40 WATT MASTR® II TRANSMITTER

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DESCRIPTION

40 Watt MASTR® II transmitters are crystal controlled, phase modulated transmitters designed for one through eight frequency operation in the 406-512 MHz frequency bands. The solid state transmitter utilizes both integrated circuits (ICs) and discrete components, and consists of the following assemblies:

- Exciter Board; with audio, modulator, amplifier and multiplier stages.
- Power Amplifier Assembly; with amplifier, driver, PA, power control, filter and antenna switch.

Figure 1 is a block diagram of the MASTR II transmitters, showing the exciter board and Power Amplifier Assembly.

The Exciter contains up to eight Integrated Circuit Oscillator Modules (ICOMs), Audio IC, modulator, and multipliers to provide 185 milliwatts (minimum) of modulated RF power to the Power Amplifier Assembly.

The Power Amplifier Assembly includes a Power Amplifier Module with power control, and a Low Pass Filter/Antenna Switch Module. The four RF power transistor stages on the Power Amplifier Module provide up to 40 Watts of output power adjusted by the power adjust circuitry.

MAINTENANCE

The PA assembly is insulated from vehicle ground to permit operation in positive or negative ground vehicles.

NOTE

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause one of the in-line fuses to blow.

MOBILE DISASSEMBLY

- To service the transmitter from the top:
  1. Pull the locking handle down, then pry up the cover at the front notch and lift off the cover.
- To service the transmitter from the bottom:

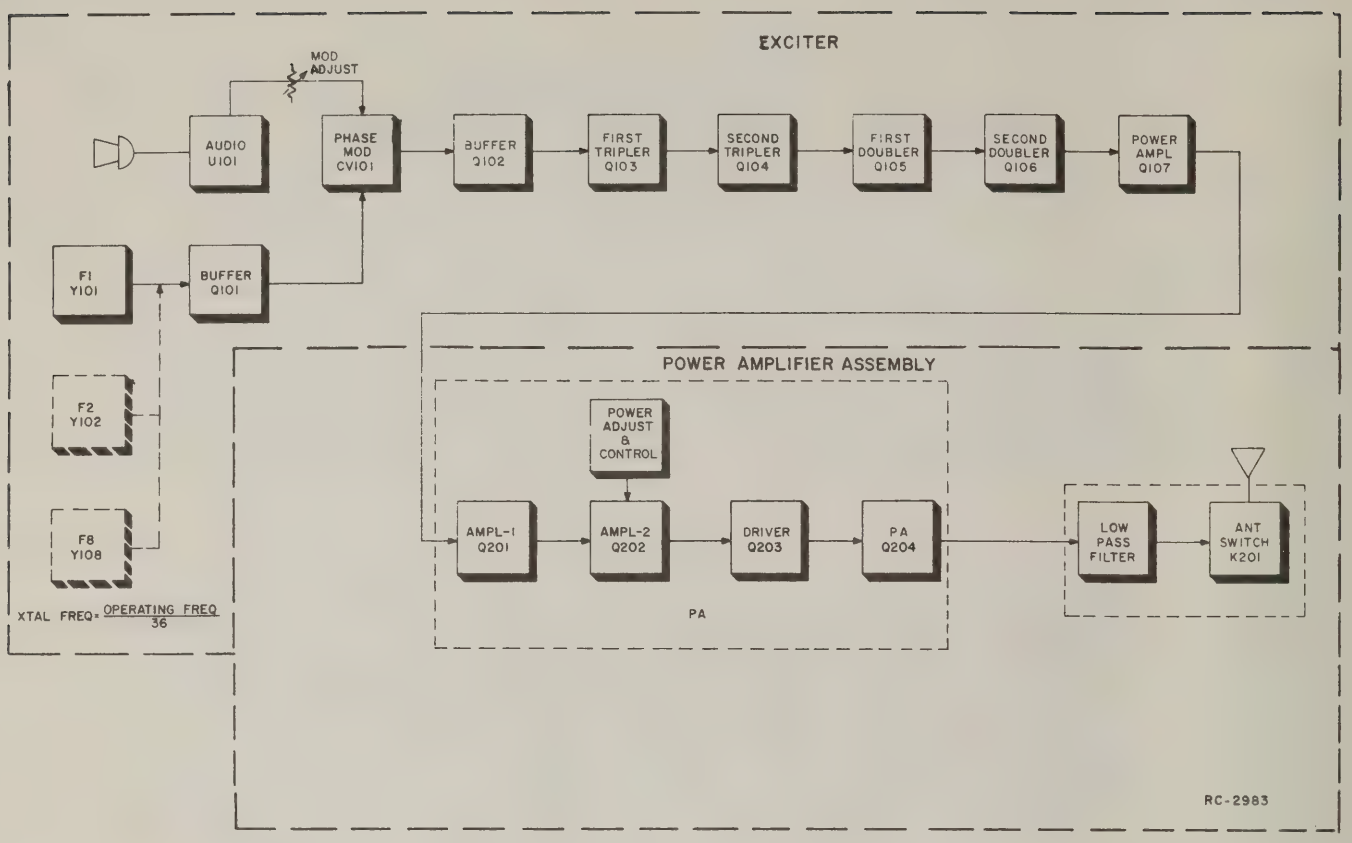

Figure 1 - Transmitter Block Diagram

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Remove the top cover, then loosen the two bottom cover retaining screws and remove the bottom cover (see Figure 4).
3. To gain access to the bottom of the exciter board, remove the six screws (A) holding the exciter board and its bottom cover to the module mounting frame, and remove the bottom cover.

NOTE

Be careful not to bend the three pins on the exciter board bottom cover during removal or installation of the cover.

STATION DISASSEMBLY

For a more complete mechanical parts breakdown refer to the station manual. To service the transmitter exciter from the front:

1. Turn the two latching knobs (A) counterclockwise to unlatch the Radio Panel Front Door. Refer to Figure 2.
2. Swing the Radio Panel Front Door down as shown.
3. Remove covers.

To service the transmitter Power Amplifier from the rear:

1. Remove the top two screws (B) on the Intermittent or Continuous Duty Power Amplifier. Refer to Figure 3.
2. Swing the Power Amplifier down as shown. Remove the top cover of the Power Amplifier.

NOTE

If the heatsink blower option is present, this blower must be removed before the Power Amplifier can be lowered.

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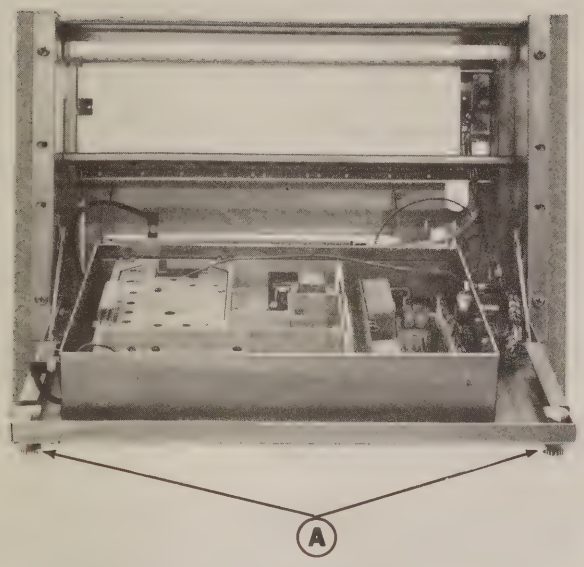


Figure 2 - Access to Exciter
Front View

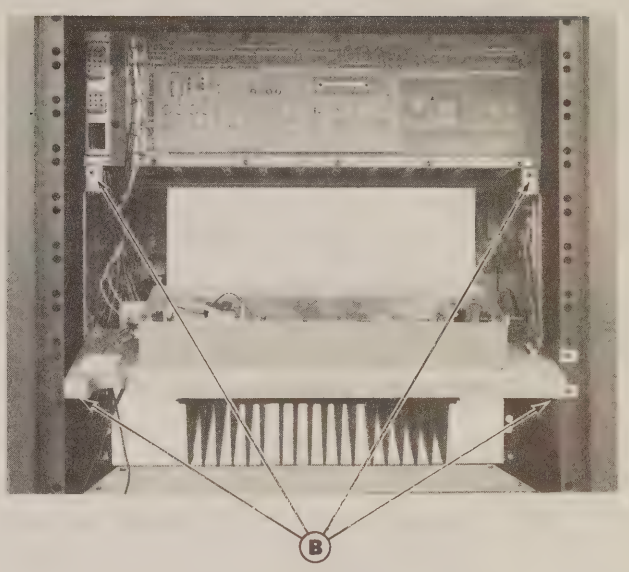
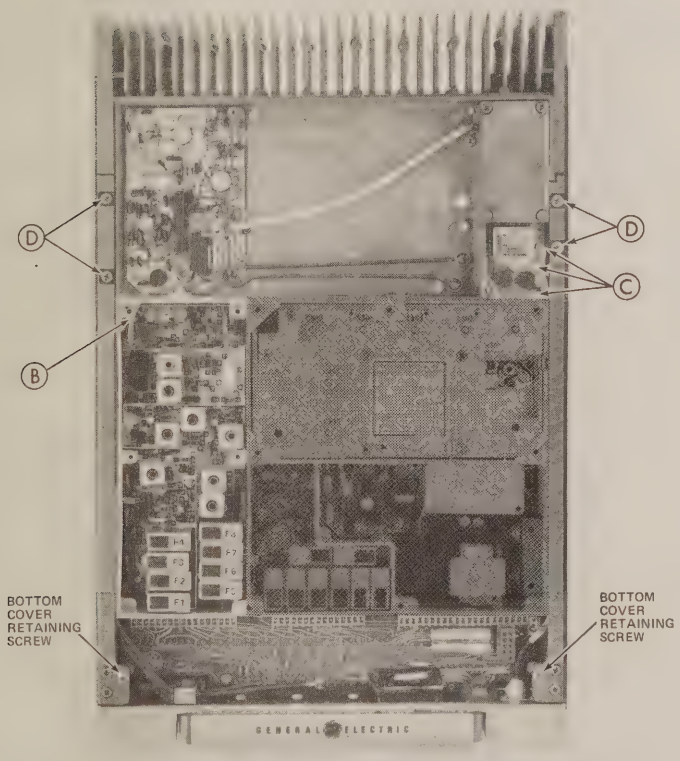


Figure 3 - Access to Power Amplifier
Rear View



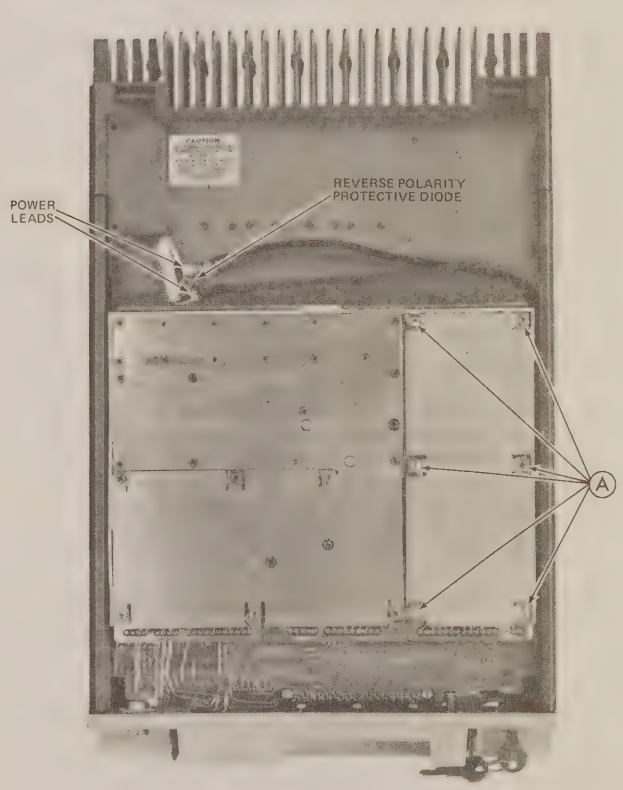


Figure 4 - Disassembly Procedure

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

TROUBLESHOOTING

A Troubleshooting Procedure, including QUICK CHECKS, permits rapid fault location in the exciter and power amplifier.

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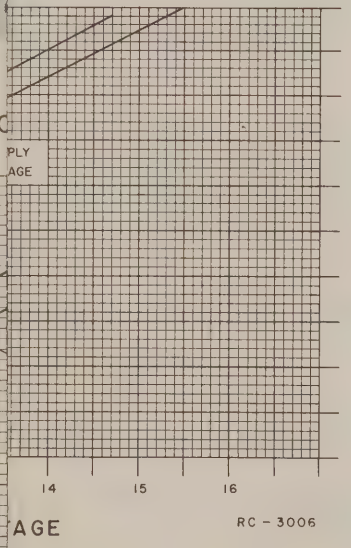
TUNING CONTROL	METER READING	PROCEDURE
T107 and T108	Maximum	Tune T107 and then T108 for maximum meter reading.
C155 and C157	Maximum	Move black Test Set plug to PA metering jack and tune C155 and then C157 for maximum meter reading.
C167, C171 & C175	Maximum	In order, tune C167, C171 and C175 for maximum meter reading.
		NOTE A quick transmitter tune-up procedure is provided in steps 13 through 18.
T101	Maximum	Move black Test Set plug to exciter metering jack and tune T101 for maximum meter reading.
T102, T103 & T104	Maximum	Alternately tune T102, T103 and T104 for maximum meter reading.
T105 and T106	Maximum	Alternately tune T105 and T106 for maximum meter reading.
T107 and T108	Maximum	Alternately tune T107 and T108 for maximum meter reading.
C155 and C157	Maximum	Move black Test Set plug to PA metering jack and alternately tune C155 and C157 for maximum meter reading. For optimum operation repeat steps 13 through 16.
C167, C171 & C175	Maximum	Alternately tune C155, C171 and C175 for maximum meter reading.
R213		With the battery voltage at 13.6 Volts or the PA collector voltage at 13.4 Volts, set Power Adjust potentiometer R213 on the PA board for the desired power output from 12 Watts to specified power output. If the battery voltage is not at 13.6 Volts or the collector voltage at 13.4 Volts and full rated output is desired, set R213 for the output power according to the battery voltage or collector voltage shown in Figure 8, 9 or 10. NOTE The PA collector voltage is measured as described in the PA POWER INPUT section.



utput Setting Chart

494 – 512 MHZ

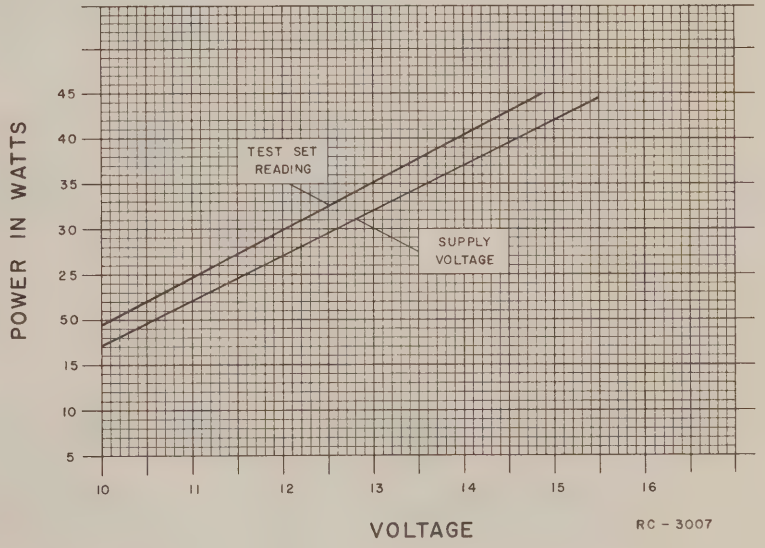


Figure 10 - Power Output Setting Chart

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

TROUBLESHOOTING

A Troubleshooting Procedure, including QUICK CHECKS, permits rapid fault location in the exciter and power amplifier.

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MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R104) was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause overmodulation are clipped by the modulation limiter. The limiter, in conjunction with the 6dB-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing overmodulation while preserving intelligibility.

TEST EQUIPMENT

1. An audio oscillator
2. A frequency modulation monitor
3. An output meter or a Voltmenter
4. GE Test Set Model 4EX3A11 or 4EX8K12

MOBILE PROCEDURE

1. Connect the audio oscillator and the meter across audio input terminals J10 (Green-Hi) and J11 (Black-Lo) on GE Test Set, and connect red Test Set plug to the System rod metering plug. If not using GE Test Set, connect audio oscillator and meter across P802-G (Mike High) through a 0.5 microfarad (or larger) DC blocking capacitor, and P802-S (Mike-Low) on the System Board.
2. Adjust the audio oscillator for 1-Volt RMS at 1000 Hz.
3. For transmitters without Channel Guard, set MOD ADJUST R104 for a 4.5-kHz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
4. For transmitters with Channel Guard, set Channel Guard MOD ADJUST R105 for zero tone deviation. Next, with the 1-Volt signal at 1000 Hz applied, set MOD ADJUST R104 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R105 for 0.75 kHz tone deviation.
5. For multi-frequency transmitters, set the deviation as described in Steps 3 or 4 on the channel producing the largest amount of deviation.

STATION PROCEDURE

1. Connect the audio oscillator and the meter across audio input terminals J10 (Green-Hi) and J11 (Black-Lo) on GE Test Set, and connect red Test Set plug to the System rod metering plug. Set the Pre-amp levels as outlined in the combination Manual.
2. Set the audio generator frequency to 1 kHz.
   A. In all station combinations except Local Control Intermittent Duty combinations, set the audio generator output to 30 millivolts RMS.
   B. In Local Control Intermittent Duty station combinations, set the audio generator output to 1.0 volts RMS.
3. For transmitters without Channel Guard, set MOD ADJUST R104 for a 4.5 kHz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
4. For transmitters with Channel Guard, set Channel Guard MOD ADJUST R105 for zero tone deviation. Next, with the audio set as in Step 2, set MOD ADJUST R104 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R105 for 0.75 kHz tone deviation.
5. For multi-frequency transmitters, set the deviation as described in Steps 3 or 4 on the channel producing the largest amount of deviation.

PA POWER INPUT

For FCC purposes, the PA power input can be determined by measuring the PA supply voltage and PA current, and using the following formula:

$$P_i = \text{PA voltage} \times \text{PA current}$$

where

P_i is the power input in Watts,

PA voltage is measured with Test Set Model 4EX3A11 in Position F on the 25-Volt range (read as 15 Volts full scale), and with the polarity switch in the (-) position. With Test Set Model 4EX8K12, use the B+ position and the 1-Volt range (read as 15 Volts full scale), with the HIGH SENSITIVITY button pressed and the polarity switch in the (-) position.

PA current is measured with the Test Set in Position F in the Test 1 position, and with the HIGH SENSITIVITY button pressed (15 amperes full scale).

Example

P_i = 13.4 Volts x 6 amperes = 80.4 Watts

ICOM FREQUENCY ADJUSTMENT

First, check the frequency to determine if any adjustment is required. The frequency should be set with a frequency meter or counter with an absolute accuracy that is 5 to 10 times better than the tolerance to be maintained, and with the entire radio as near as possible to an ambient temperature of 26.5°C (79.8°F).

MASTR II ICOMs should be reset only when the frequency shows deviation in excess of the following limits:

A. ±0.5 PPM, when the radio is at 26.5°C (79.8°F).

B. ±2 PPM at any other temperature within the range of -5°C to +55°C (+23°F to +131°F).

C. The specification limit (±2 PPM or ±5 PPM) at any temperature within the range of -40°C to -5°C (-40°F to +23°F) or +55°C to +70°C (+131°F to +158°F).

If any adjustment is required, pry up the cover(where presention the top of the ICOM to expose the trimmer, and use one the following procedures:

If the radio is at an ambient temperature of 26.5°C (79.8°F), set the oscillator for the correct operating frequency.

If the radio is not at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

A. To hold the setting error to ±0.6 PPM (which is considered reasonable for 5 PPM ICOMs):
   1. Maintain the radio at 26.5°C (±5°C) and set the oscillator to desired frequency, or -
   2. Maintain the radio at 26.5°C (±10°C) and offset the oscillator, as a function of actual temperature, by the amount shown in Figure 7.

B. To hold the setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMs): Maintain unit at 26.5°C (±5°C) and offset the oscillator as a function of actual temperature, by the amount shown in Figure 7.

For example: Assume the ambient temperature of the radio is 18.5°C (65.4°F). At that temperature, the curve shows a correction factor of 0.3 PPM. (At 406 MHz, 1 PPM is 406 Hz. At 512 MHz, 1 PPM is 512 Hz).

With an operating frequency of 450 MHz, set the oscillator for a reading of 135 Hz (0.3 x 450 Hz) higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 26.5°C), set the oscillator for the indicated PPM lower than the licensed operating frequency.

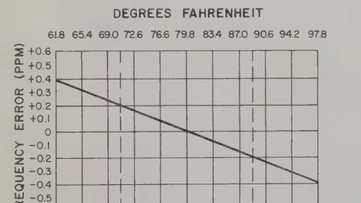
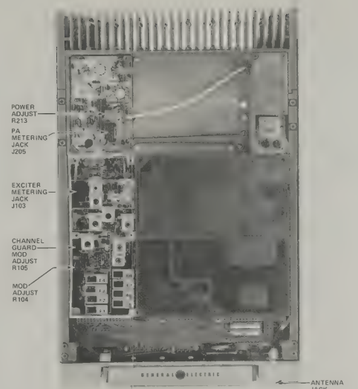


Figure 7 - Frequency Characteristics Vs. Temperature



406- 470 MHZ

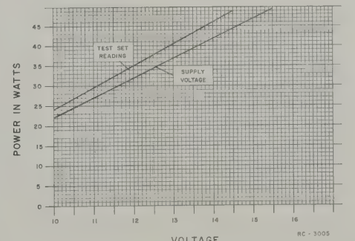


Figure 8 - Power Output Setting Chart

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
2. A 50 ohm wattmeter connected to antenna jack J906.
3. A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place ICOMs on Exciter Board (crystal frequency = operating frequency ÷ 36).
2. For a large change in frequency or a badly mis-aligned transmitter, pressc all slugs to the top of the coil form.
3. Set output impedance matching capacitor C175 to 1/3 mesh.
4. Set all other air variable capacitors to minimum capacity (not meshed).

NOTE

The tuning frequency for multi-frequency transmitters is determined by the operating frequency and the frequency spread between transmitters. Refer to the table below for maximum frequency spread.

5. For multi-frequency transmitters with a frequency spread less than that specified in column (1) tune the transmitters to the lowest frequency. For a frequency spread exceeding the limits specified in column (1) tune the transmitters using a center frequency tune up crystal module or ICOM as required. The maximum frequency spread can be extended to the limits specified in column (3) with 1 dB degradation.

Multi-Frequency Transmitter Tuning

Transmitter Frequency Range	MAXIMUM FREQUENCY SPREAD		
	(1) Without center tuning	(2) With center tuning	(3) With center tuning (1 dB degradation)
406 - 470 MHz	2.75 MHz	5.50 MHz	9.00 MHz
470 - 494 MHz	2.90 MHz	5.80 MHz	9.50 MHz
494 - 512 MHz	3.00 MHz	6.00 MHz	9.75 MHz

6. Connect the red plug on the GE Test Set to the System Board metering jack, and the black plug to the Exciter meter jack. Set the polarity to +, and set the range to the Test 1 position (1 Volt position for 4EX8K12) for all adjustments.

NOTE

With the Test Set connected to the PA metering jack, the voltage reading at position "F" with the HIGH SENSITIVITY button pressed may be converted to PA collector current by reading the current as 15 amperes full scale.

7. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

NOTE

When the need for minor adjustments to the transmitter are indicated, perform steps 13 through 17 for a quick transmitter tune-up.

ALIGNMENT PROCEDURE

STEP	METER POSITION: GE TEST SET	METER POSITION: INTERNAL METERING	TUNING CONTROL	METER READING	PROCEDURE
					NOTE: When aligning transmitter, proceed as instructed below. DO NOT retune a previously tuned control unless specifically directed to do so.
1.	B (MULT-1)	2 (MULT-1)	T101, T102 & T103	See Prodedure	Tune T101 for maximum meter reading. Then tune T102 for a dip (small) in meter reading and tune T103 for maximum meter reading.
2.	C (MULT-2)	3 (MULT-2)	T104 and T105	See Procedure	Tune T104 for maximum meter reading, then tune T105 for a dip in meter reading.
3.	D (MULT-3)	4 (MULT-3)	T106 and T107	See Procedure	Tune T106 for maximum meter reading and then tune T107 for a dip in meter reading.
4.	F (MULT-4)	5 (MULT-4)	T108 and C155	See Procedure	Tune T108 for maximum meter reading and then tune C155 for a dip in meter reading.
5.	G (AMPL-1)	6 (AMPL-1)	C157 and C167	See Procedure	Tune C157 for maximum meter reading, and then tune C167 for a dip in meter reading.
6.	D (AMPL-1)	8 (AMPL-1 DRIVE on PA)	C171 and C175	Maximum	Move black Test Set plug to PA metering jack and tune C171 and then C175 for maximum meter reading.
7.	B (MULT-1)	2 (MULT-1)	T101	Maximum	Move black Test Set plug to exciter metering jack and tune T101 for maximum meter reading.
8.	C (MULT-2)	3 (MULT-2)	T102, T103 & T104	Maximum	In order, tune T102, T103 and T104 for maximum meter reading.
9.	D (MULT-3)	4 (MULT-3)	T105 and T106	Maximum	Tune T105 and then T106 for maximum meter reading.

ALIGNMENT PROCEDURE (Cont'd)

STEP	METER POSITION: GE TEST SET	METER POSITION: INTERNAL METERING	TUNING CONTROL	METER READING	PROCEDURE
10.	B (MULT-4)	5 (MULT-4)	T107 and T108	Maximum	Tune T107 and then T108 for maximum meter reading
11.	D (AMPL-1)	8 (AMPL-1)	C155 and C157	Maximum	Move black Test Set plug to PA metering jack and tune C155 and then C157 for maximum meter reading.
12.	D (AMPL-1)	8 (AMPL-1)	C167, C171 & C175	Maximum	In order, tune C167, C171 and C175 for maximum meter reading
					NOTE: A quick transmitter tune-up procedure is provided in steps 13 through 18.
13.	B (MULT-1)	2 (MULT-1)	T101	Maximum	Move black Test Set plug to exciter metering jack and tune T101 for maximum meter reading.
14.	C (MULT-2)	3 (MULT-2)	T102, T103 & T104	Maximum	Alternately tune T102, T103 and T104 for maximum meter reading
15.	D (MULT-3)	4 (MULT-3)	T105 and T106	Maximum	Alternately tune T105 and T106 for maximum meter reading
16.	F (MULT-4)	5 (MULT-4)	T107 and T108	Maximum	Alternately tune T107 and T108 for maximum meter reading.
17.	G (AMPL-1)	8 (AMPL-1)	C155 and C157	Maximum	Move black Test Set plug to PA metering jack and alternately tune C155 and C157 for maximum meter reading. For optimum operation repeat steps 13 through 16
18.	D (AMPL-1)	8 (AMPL-1)	C167, C171 & C175	Maximum	Alternately tune C155, C171 and C175 for maximum meter reading
19.			R213		With the battery voltage at 13.6 Volts or the PA collector voltage at 13.4 Volts, set Power Adjust potentiometer R213 on the PA board for the desired power output from 12 Watts to specified power output If the battery voltage is not at 13.6 Volts or the collector voltage at 13.4 Volts and full rated output is desired, set R213 for the output power according to the battery voltage or collector voltage shown in Figure 9, 9 or 10 NOTE: The PA collector voltage is measured as described in the PA POWER INPUT section.

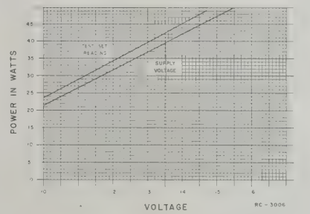


Figure 9 - Power Output Setting Chart

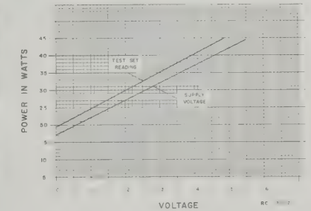
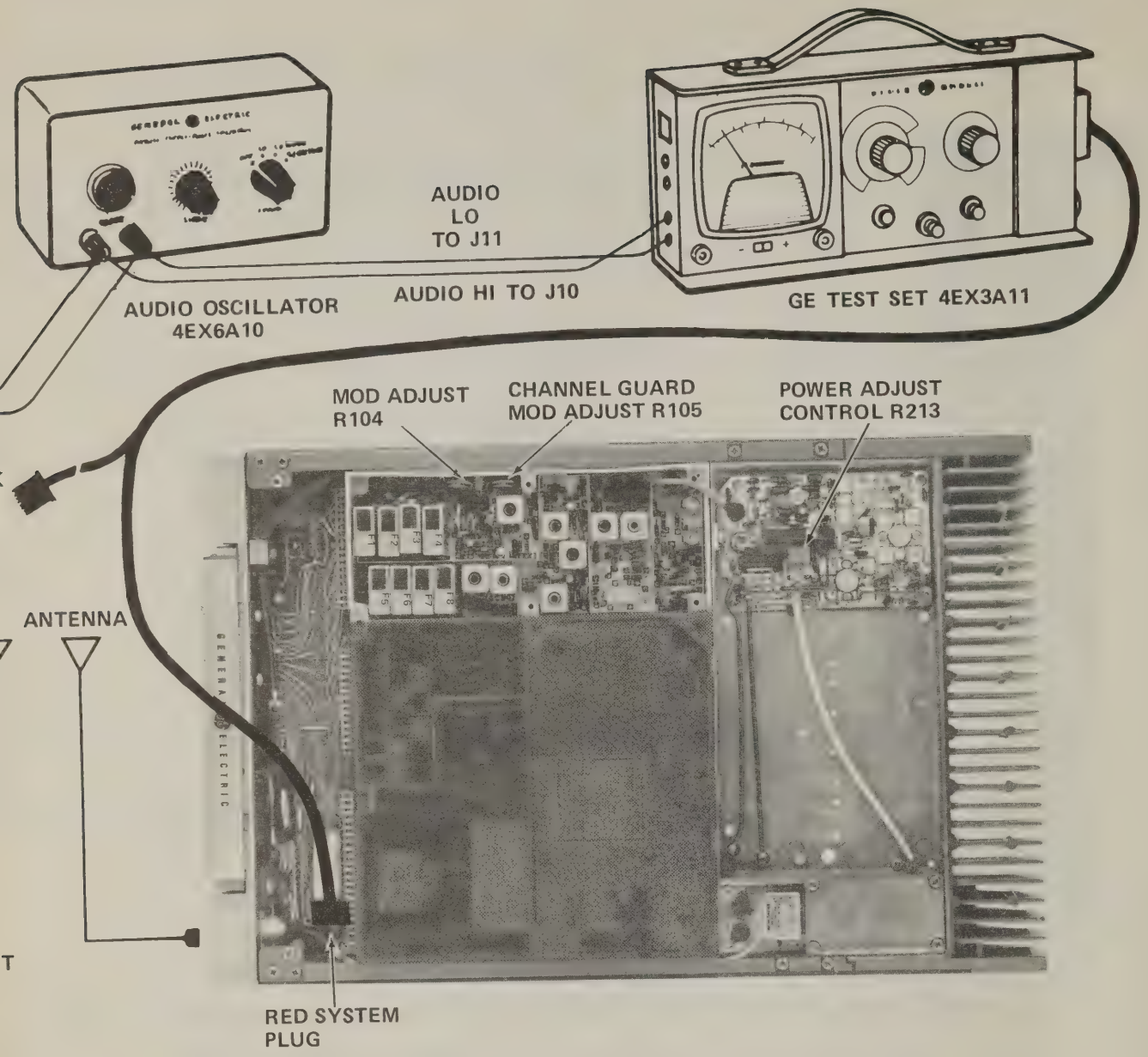


Figure 10 - Power Output Setting Chart



DEVIATION WITH CHANNEL GUARD

ion Meter and monitor the output of the transmitter.

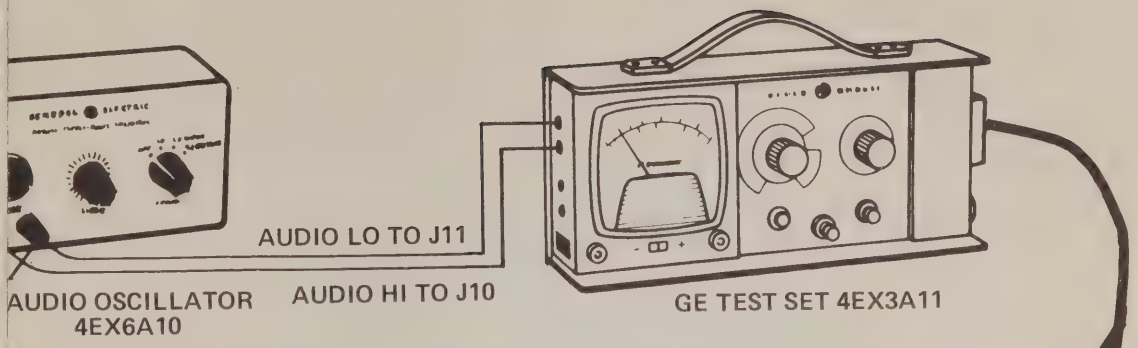
signal from the audio generator.

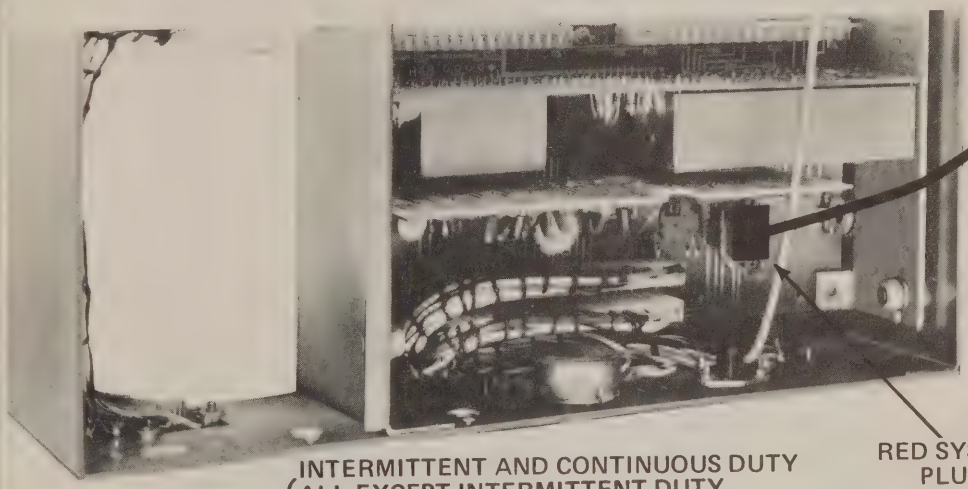
er and check for 0.75 kHz deviation. If the reading is low or high, ord MOD ADJUST R105 for a reading of 0.75 kHz.

with Channel Guard, the Phase Modulator Tuning should be adjusted re proper performance. (Refer to Step 1 in the Transmitter

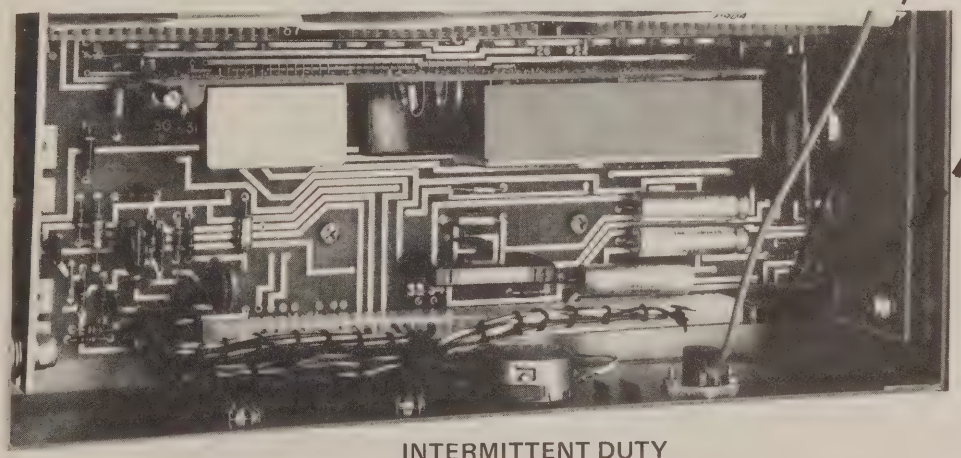
n Test Procedures should be repeated every time the Tone Frequency

METERING





INTERMITTENT AND CONTINUOUS DUTY (ALL EXCEPT INTERMITTENT DUTY LOCAL CONTROL) SYSTEM BOARD



INTERMITTENT DUTY LOCAL CONTROL SYSTEM BOARD

TEST PROCEDURES

These Test Procedures are designed to assist you in servicing a transmitter that is operating--but not properly. Problems encountered could be low power output, tone and voice deviation, defective audio sensitivity, and modulator adjust control set too high. Once a defect is pin-pointed, refer to the "Service Check" and the additional corrective measures included in the Transmitter Troubleshooting Procedure. Before starting with the Transmitter Test Procedures, be sure the transmitter is tuned and aligned to the proper operating frequency.

CAUTION

Before bench testing the MASTR II Mobile Radio, be sure of the output voltage characteristics of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed (50 ohm resistive load): 18 Volts
Transmitter keyed (no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limits shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.6 VDC for loads of 6 to 16 amperes: 13.4 VDC for loads of 16 to 36 amperes). Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

TEST EQUIPMENT REQUIRED

for test hookup as shown:

1. Wattmeter similar to:
   Bird # 43
   Jones # 711N
2. VTVM similar to:
   Triplett # 850
   Heath # IM-21
3. Audio Generator similar to:
   GE Model 4EX6A10
4. Deviation Meter (with a .75 kHz scale) similar to:
   Measurements # 720
5. Multimeter similar to:
   GE TEST SET MODEL 4EX3A11,
   MODEL 4EX8K12 or
   20,000 ohms-per-Volt voltmeter

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output from the antenna jack to the wattmeter through a 50-ohm coaxial cable. Make sure the wattmeter is terminated into a 50-ohm load.
2. Key the transmitter and check the wattmeter for the desired power output.

SERVICE CHECK

Check the setting of the Power Adjust Control (R213).

Refer to the QUICK CHECKS on the Transmitter Troubleshooting Procedure.

VOICE DEVIATION, SYMMETRY AND AUDIO SENSITIVITY

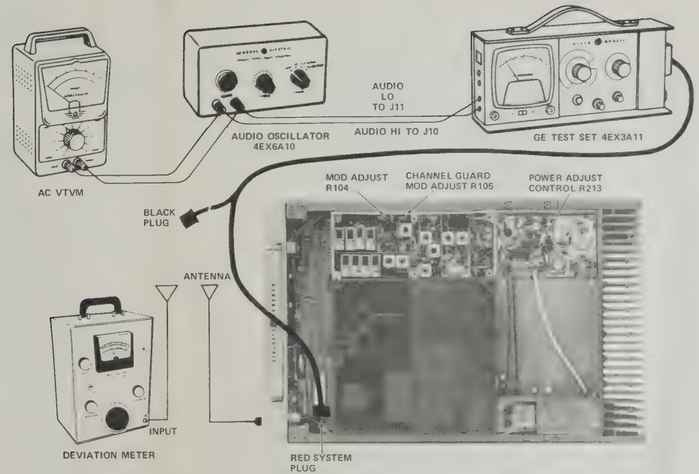
TEST PROCEDURE

1. Connect the test equipment to the transmitter as shown.
2. In radios with Channel Guard, set Channel Guard Mod Adjust R105 for zero tone deviation.
3. In Mobile and Local Control Intermittent Duty Station combinations only, set the audio generator output to 1.0 volt RMS and the frequency to 1 kHz.

   In all other Station combinations, set the audio generator output to 30 millivolts RMS and the frequency to 1 kHz.
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ±4.5 kHz in radios without Channel Guard, and ±3.75 kHz in radios with Channel Guard.
6. If necessary, adjust MOD ADJUST control R104 for the proper deviation on plus (+) or minus (-) deviation, whichever is greater.

NOTES: -- MASTR II transmitters are adjusted for 4.5 kHz deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz under the worst conditions of frequency, voltage and temperature.

7. If the deviation reading plus (+) or minus (-) differs by more than 0.5 kHz, recheck Steps 1 and 2 as shown in the Transmitter Alignment Chart.
8. Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz for radios without Channel Guard, or 2.25 kHz for radios with Channel Guard. Voltage should be LESS than 120 millivolts. If not, refer to the Transmitter Troubleshooting Procedure.



TONE DEVIATION WITH CHANNEL GUARD

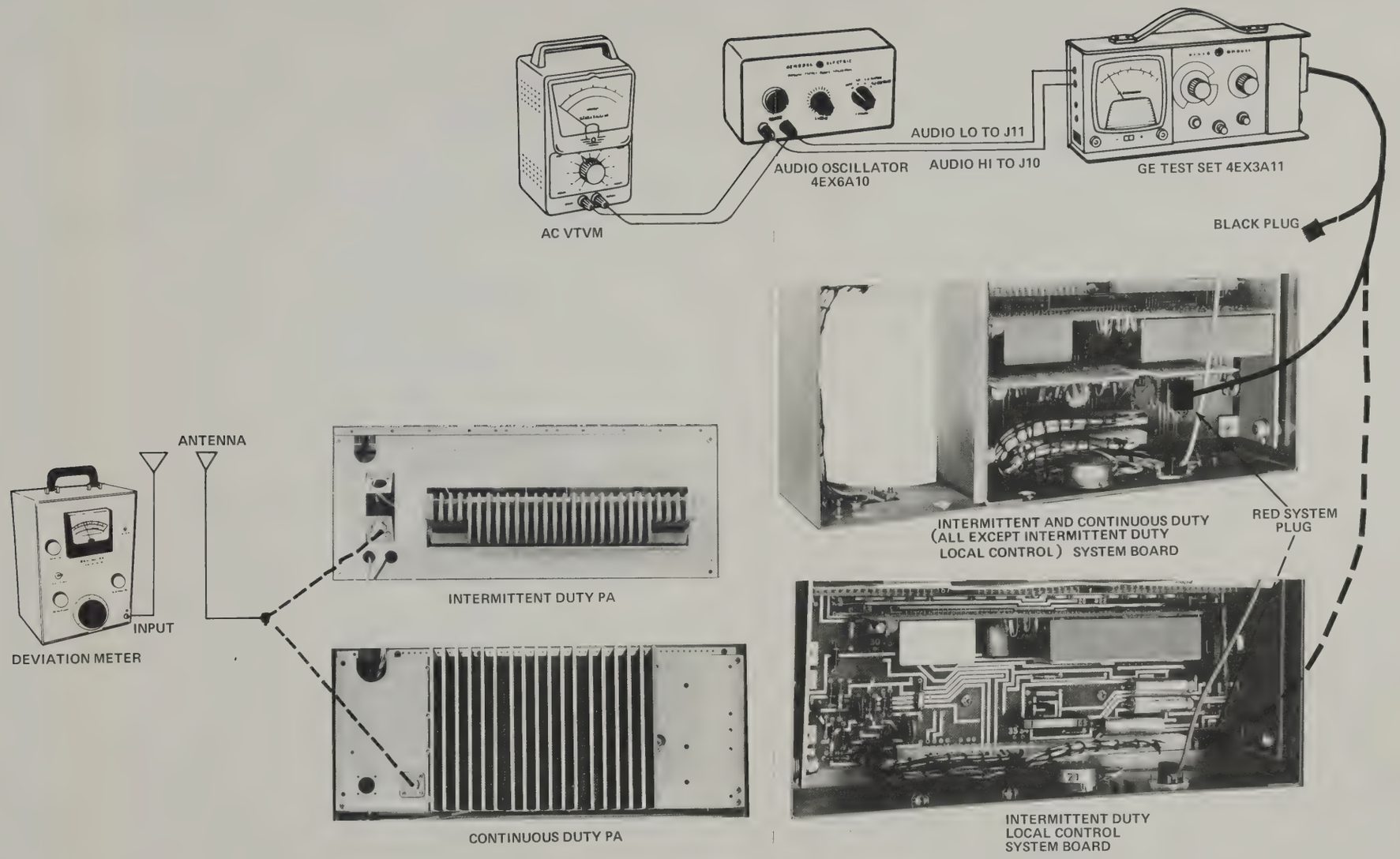
TEST PROCEDURE

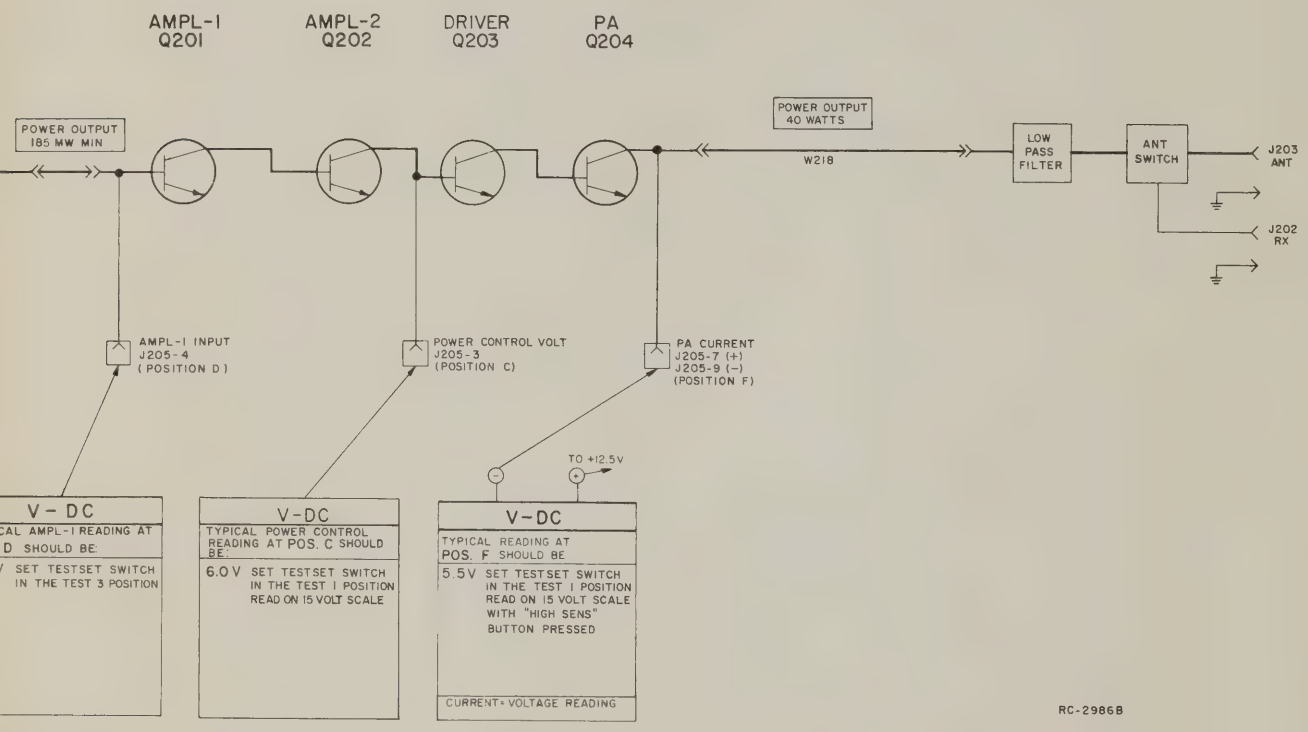
1. Set up the Deviation Meter and monitor the output of the transmitter.
2. Remove the 1000 Hz signal from the audio generator.
3. Key the transmitter and check for 0.75 kHz deviation. If the reading is low or high, adjust Channel Guard MOD ADJUST R105 for a reading of 0.75 kHz.

NOTES:

1. On units supplied with Channel Guard, the Phase Modulator Tuning should be adjusted carefully to insure proper performance. (Refer to Step 1 in the Transmitter Alignment Chart).
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STATION METERING




AMPL-1
Q201
AMPL-2
Q202
DRIVER
Q203
PA
Q204
POWER OUTPUT
185 MW MIN
POWER OUTPUT
40 WATTS
W218
LOW
PASS
FILTER
ANT
SWITCH
J203
ANT
J202
RX
AMPL-1 INPUT
J205-4
(POSITION D)
POWER CONTROL VOLT
J205-3
(POSITION C)
PA CURRENT
J205-7 (+)
J205-9 (-)
(POSITION F)
TO +12.5V
V-DC
CAL AMPL-1 READING AT
D SHOULD BE:
SET TESTSET SWITCH
IN THE TEST 3 POSITION
V-DC
TYPICAL POWER CONTROL
READING AT POS. C SHOULD
BE:
6.0 V SET TESTSET SWITCH
IN THE TEST 1 POSITION
READ ON 15 VOLT SCALE
V-DC
TYPICAL READING AT
POS. F SHOULD BE
5.5V SET TESTSET SWITCH
IN THE TEST 1 POSITION
READ ON 15 VOLT SCALE
WITH "HIGH SENS"
BUTTON PRESSED
CURRENT= VOLTAGE READING
RC-2986B

MOBILE RADIO

MAINTENANCE MANUAL

406—512 MHz EXCITER BOARD 19D423865G2 & G4

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DESCRIPTION

The exciter uses seven transistors and an integrated circuit to provide 185 milliwatts of RF drive to the PA assembly.

The exciter can be equipped with up to eight Integrated Circuit Oscillator Modules (ICOMs). The ICOM crystal frequency ranges from approximately 11.3 to 14.2 megahertz, and the crystal frequency is multiplied 36 times.

Audio, supply voltages and control functions are connected from the system board to the exciter board through P902.

Centralized metering jack J103 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The test set meters the modulator, multiplier and amplifier stages, and the regulated 10-Volts.

CIRCUIT ANALYSIS

ICOMS

Three different types of ICOMs are available for use in the exciter. Each of the ICOMs contains a crystal-controlled Colpitts oscillator, and two of the ICOMs contain compensator ICs. The different ICOMs are:

- 5C-ICOM - contains an oscillator and a 5 part-per-million (±0.0005%) compensator IC. Provides compensation for EC-ICOMs.
- EC-ICOM - contains an oscillator only. Requires external compensation from a 5C-ICOM.
- 2C-ICOM - contains an oscillator and a 2 PPM (±0.0002%) compensator IC. Will not provide compensation for an EC-ICOM.

The ICOMs are enclosed in an RF shielded can with the type ICOM (5C-ICOM, EC-ICOM or 2C-ICOM) printed on the top of the can. Access to the oscillator trimmer is obtained through a hole on the top of the can.

NOTE

For proper operation, be sure ICOM case makes contact with fingers on the RF shield on the exciter board. Also, the pins on the exciter bottom cover must make contact with the RF shield.

Frequency selection is accomplished by switching the ICOM keying lead (terminal 6) to A- by means of the frequency selector switch on the control unit. In single-frequency radios, a jumper from H9 to H10 in the control unit connects terminal 6 of the ICOM to A-. The oscillator is turned on by applying a keyed +10 Volts to the external oscillator load resistor.

CAUTION

All ICOMs are individually compensated at the factory and cannot be repaired in the field. Any attempt to repair or change an ICOM frequency will void the warranty.

In Standard 5 PPM radios using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs in the transmit and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (5 Volts) from the 10-Volt regulator IC. If desired, up to 16 5C-ICOMs may be used in the radio.

The 2C-ICOMs are self-compensated at 2 PPM and will not provide compensation for EC-ICOMs.

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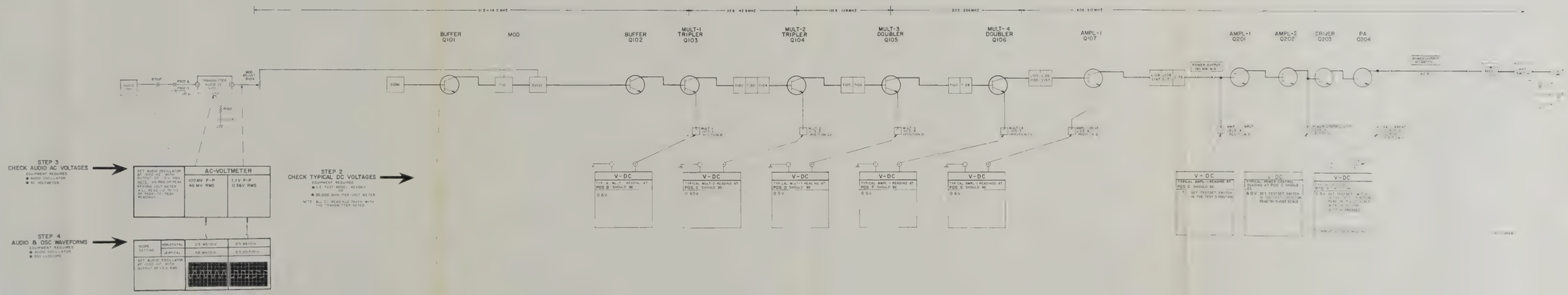
STEP I - QUICK CHECKS

METER POSITION GE TEST SET	PROBABLE DEFECTIVE STAGE		
	HIGH METER READING	LOW METER READING	ZERO METER READING
EXCITER			
B (MULT-1)	Q102, Q103, T102	Q102, Q103, T102	Q102, Q103, T102
C (MULT-2)	Q104, T105	T102, T103, Q104, T104	T102, T104, Q104, T105, T103
D (MULT-3)	Q105, T107	T105, T106, Q105	T105, T106, Q105, T107
E (MULT-4)	Q106, C155	Q106, T107, T108, LJ04	Q106, T107, T108, LJ04
G (AMPL-1)	Q107, LJ13	Q107, C115 - C157, LJ07	Q107, C155 - C157, LJ07
POWER AMPLIFIER			
C (Power Control)		Q215, R213, VR201, VR202, CR31, Q202	Q215, R213, VR201, VR202, CR31, Q202
"D" (AMPL-1 INPUT)		Low Output Exciter, CR201	No Output Exciter, CR201, CR05
"E" (PA CURRENT)	Q204, T205	Q204, Low Output Q203	Q204, No Input From Q203, Check Pos C & D



MAINTENANCE MANUAL

406—512 MHz EXCITER BOARD 19D423865G2 & G4

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CAUTION

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In Standard 5 PPM radios using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs in the transmit and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (5 Volts) from the 10-Volt regulator IC. If desired, up to 16 5C-ICOMs may be used in the radio.

The 2C-ICOMs are self-compensated at 2 PPM and will not provide compensation for EC-ICOMs.

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Oscillator Circuit

The quartz crystals used in ICOMs exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

At both the coldest and hottest temperatures, the frequency increases with increasing temperature. In the middle temperature range (approximately 0°C to 55°C), frequency decreases with increasing temperature.

Since the rate of change is nearly linear over the mid-temperature range, the output frequency change can be compensated by choosing a parallel compensation capacitor with a temperature coefficient approximately equal and opposite that of the crystal.

Figure 1 shows the typical performance of an uncompensated crystal as well as the typical performance of a crystal which has been matched with a properly chosen compensation capacitor.

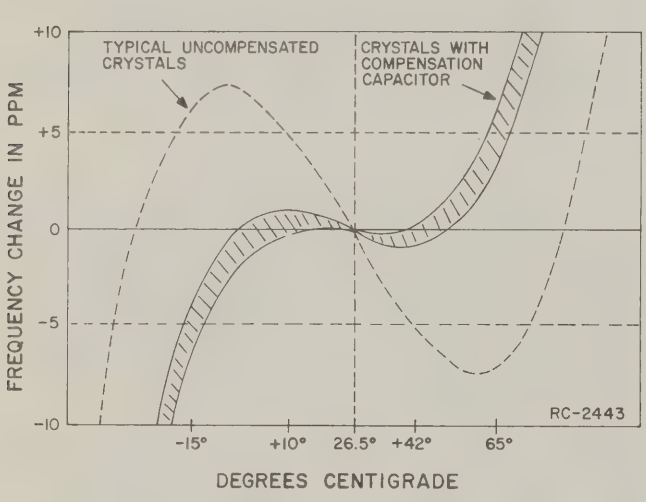

Figure 1 - Typical Crystal Characteristics

At temperatures above and below the mid-range, additional compensation must be introduced. An externally generated compensation voltage is applied to a varactor (voltage-variable capacitor) which is in parallel with the crystal.

A constant bias of 5 Volts (provided from Regulator IC U901 in parallel with the compensator) establishes the varactor capacity at a constant value over the entire mid-temperature range. With no additional compensation, all of the oscillators will provide 2 PPM frequency stability from 0°C to 55 °C (+32°F to 131°F).

Compensator Circuits

Both the 5C-ICOMs and 2C-ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation. An equivalent ICOM circuit is shown in Figure 2.

The cold end compensation circuit does not operate at temperatures above 0°C. When the temperature drops below 0°C, the circuit is activated. As the temperature decreases, the equivalent resistance decreases and the compensation voltage increases.

The increase in compensation voltage decreases the capacity of the varactor in the oscillator, increasing the output frequency of the ICOM.

The hot end compensation circuit does not operate at temperatures below +55°C. When the temperature rises above +55°C, the circuit is activated. As the temperature increases, the equivalent resistance decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacity of the varactor, decreasing the output frequency of the ICOM.

SERVICE NOTE: Proper ICOM operation is dependent on the closely-controlled input voltages from the 10-Volt regulator. Should all of the ICOMs shift off frequency, check the 10-Volt regulator module.

AUDIO IC

The transmitter audio circuitry is contained in audio IC U101. A simplified drawing of the audio IC is shown in Figure 3.

Audio from the microphone at pin 12 is coupled through pre-emphasis capacitor C1 to the base of Q1 in the operational amplifier-limiter circuit. Collector voltage for the transistorized microphone preamplifier is supplied from pin 11 through microphone collector load resistor R18 to pin 12.

The operational amplifier-limiter circuit consists of Q1, Q2 and Q3. Q3 provides limiting at high signal levels. The gain of the operational amplifier circuit is fixed by negative feedback through R19, R20 and the resistance in the network (Pin 9).

The output of Q3 is coupled through a de-emphasis network (R10 and C3) to an active post-limiter filter consisting of C4, C5, C6, R11, R12, R13, R15, R17 and Q4.

Following the post-limiter filter is class A amplifier Q5. The output of Q5 is coupled through MOD ADJUST potentiometer R104 and resistor R109 to the phase modulator.

SERVICE NOTE: If the DC voltages to the Audio IC are correct and no audio output can be obtained, replace U101.

For radios equipped with Channel Guard, tone from the encoder is applied to the phase modulator through CHANNEL GUARD MOD

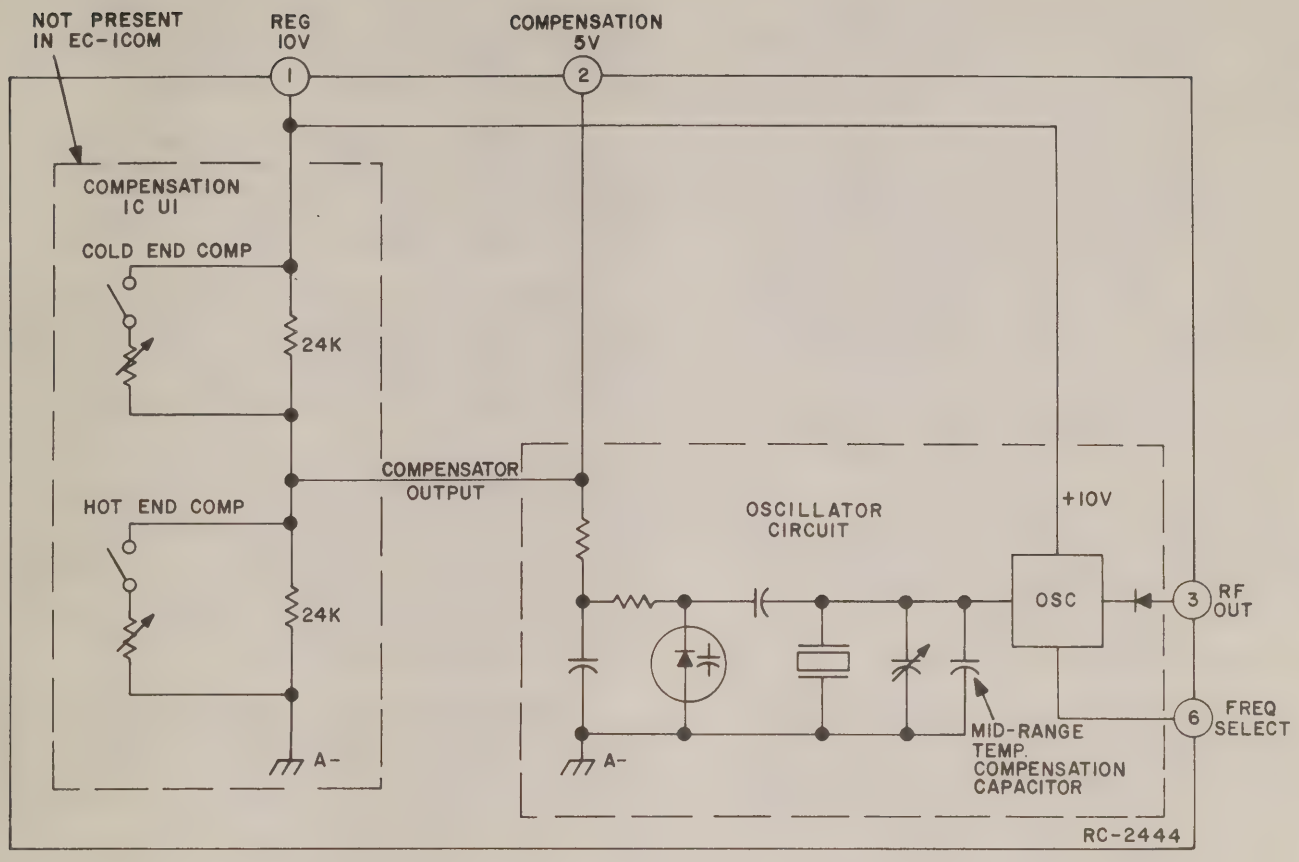

Figure 2 - Equivalent ICOM Circuit

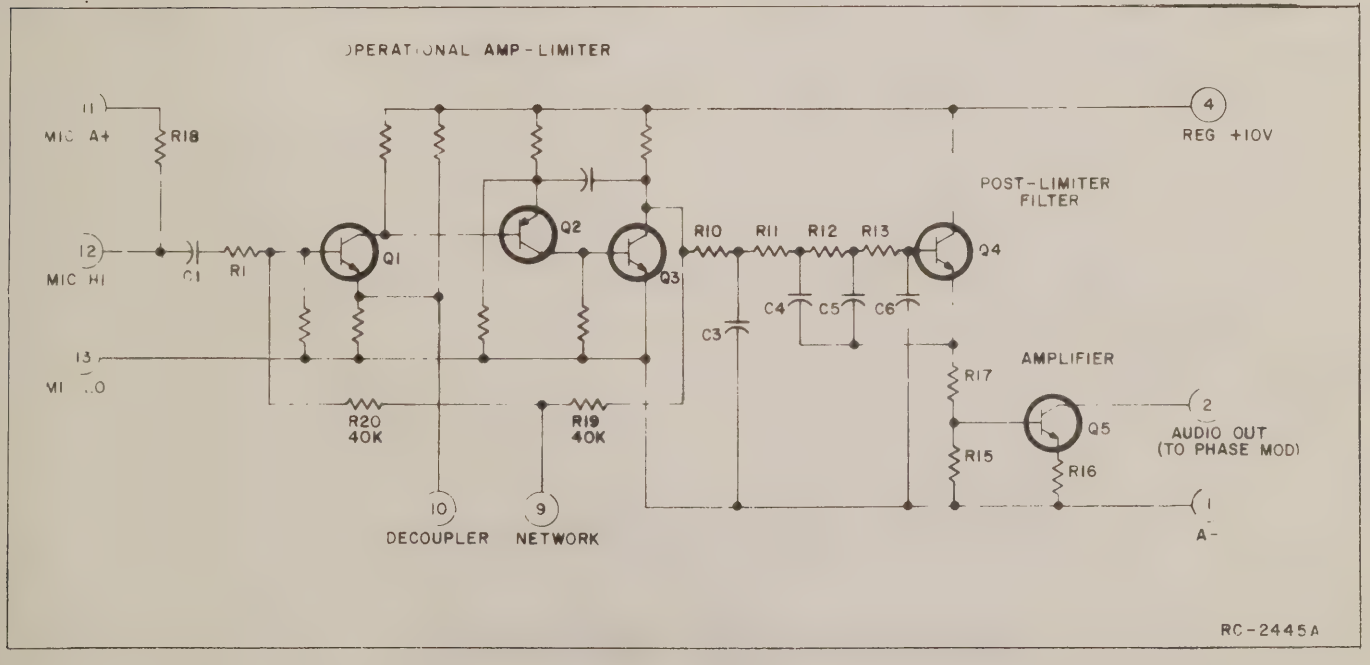

Figure 3 - Simplified Audio IC

ADJUST potentiometer R105, and resistor R113. Instructions for setting R105 are contained in the modulation adjustment section of the Transmitter Alignment Procedure.

BUFFER & PHASE MODULATOR

The output at pin 3 of the selected ICOM is coupled through buffer-amplifier Q101 to the modulator stage. The phase modulator is varactor (voltage-variable capacitor), CV101 in series with tunable coil T101. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator circuit through blocking capacitor C109 varies the bias of CV101, resulting in a phase modulated output. A voltage divider network (R106 and R112) provides the proper bias for varactor CV101.

The output of the modulator is coupled through blocking capacitor C116 to the base of buffer Q102. C116 and C117 also provide impedance matching between the modulator and buffer Q102.

BUFFER, MULTIPLIERS & AMPLIFIER

Buffer Q102 is saturated when no RF signal is present. Applying an RF signal to Q102 provides a sawtooth waveform at its collector to drive class C tripler, Q103. The first tripler stage is metered through R117. The output of Q103 is coupled through tuned circuits T102, T103, and T104 to the base of the second tripler, Q104. T102, T103 and T104 are tuned to three times the crystal frequency. The second tripler stage, Q104 is metered through R122.

The output of Q104 is coupled through tuned circuits T105 and T106 to the base of first doubler Q105. T105 and T106 are tuned to nine times the crystal frequency. Q105 is metered through R126.

The output of Q105 is coupled through two tuned circuits (T107 and T108) to the base of second doubler Q106. These circuits are tuned to 18 times the crystal frequency (one-half the transmitter operating frequency). Q106 is metered through R133.

The output of Q106 is coupled to the base of power amplifier Q107 through impedance matching networks composed of C152, C155, L105, C156, C157, L106, and C161. These networks are all tuned to the operating frequency and present a high shunt impedance at the operating frequency. All other frequencies are shunted to ground. Q107 is metered through R142.

Impedance matching network C166, C157, L108, L113, C171, L109, and C175 matches the output of Q107 to the input of the PA Assembly. C167, C171, and C175 are tuned to the proper operating frequency.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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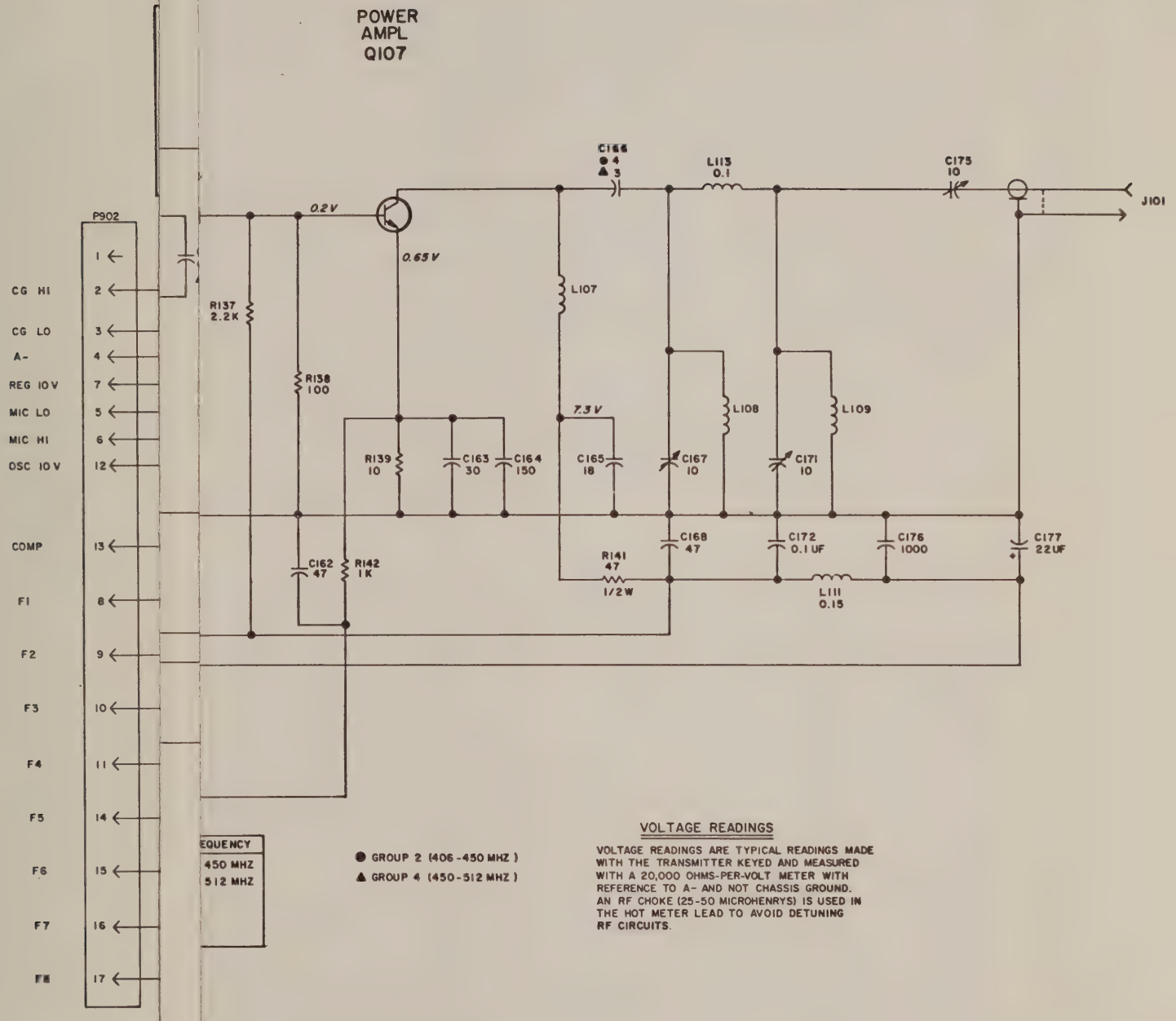
OUTLINE DIAGRAM

406—512 MHz EXCITER BOARD
19D423865G2 & G4



VOLTAGE READINGS

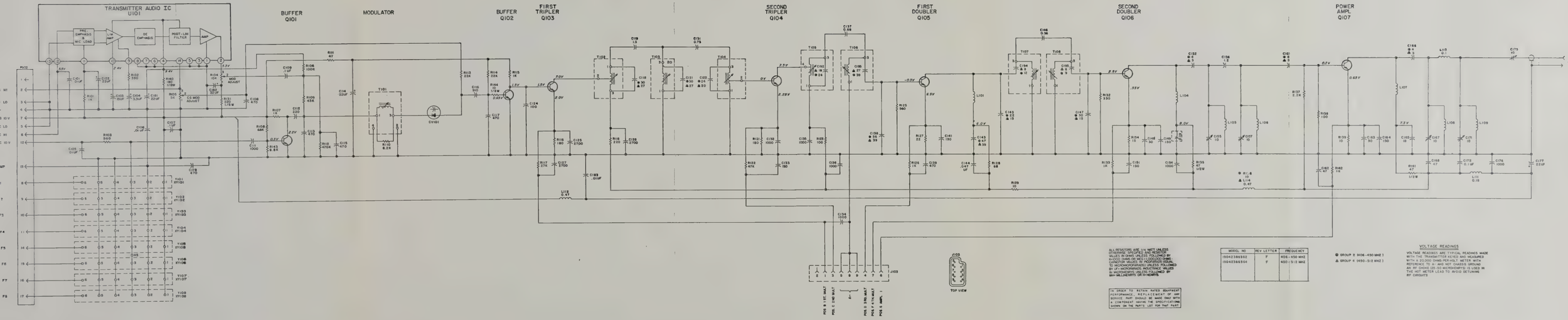
VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER WITH REFERENCE TO A- AND NOT CHASSIS GROUND. AN RF CHOKE (25-50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS.

SCHEMATIC DIAGRAM

406—512 MHz EXCITER BOARD
19D423865G2 & G4

OUTLINE DIAGRAM

406—512 MHz EXCITER BOARD
19D423865G2 & G4


TRANSMITTER AUDIO IC U101
BUFFER Q101
MODULATOR
BUFFER Q102
FIRST TRIPLER Q103
SECOND TRIPLER Q104
FIRST DOUBLER Q105
SECOND DOUBLER Q106
POWER AMPL Q107
PRE-EMPHASIS MIC LOAD
LOW AMP
DE-EMPHASIS
POST-LIM FILTER
AMP
J103
TOP VIEW
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED. RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=000 OHMS OR MEG=1,000,000 OHMS. ALL CAPACITORS ARE IN MICROFARADS UNLESS FOLLOWED BY P= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.
MODEL NO | REV LETTER | FREQUENCY
19D423863G2 | F | 406-450 MHz
19D423863G4 | F | 450-512 MHz
● GROUP 3 (406-450 MHz)
▲ GROUP 4 (450-512 MHz)
VOLTAGE READINGS
VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER WITH REFERENCE TO A- AND NOT CHASSIS GROUND. AN RF CHOKE (25-50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS.

(19B633215, Rev. B)

SCHEMATIC DIAGRAM

406—512 MHz EXCITER BOARD
19D423865G2 & G4

MOBILE RADIO

MAINTENANCE MANUAL

406—512 MHz, 40 WATT POWER AMPLIFIER ASSEMBLY

I9D424888G5-8, G22-25 AND G35, G36 (MOBILE & STATION)

I9D424895G5-8, G22-25 AND G36, G37 (CONTINUOUS DUTY STATION)

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DESCRIPTION

The PA assembly uses four RF power transistors tp provide rated output power. R213, located on the PA module, is used to adjust the output power over a range of 12 Watts to rated output power. The power control circuit consists of R213, Q215, and Power Control IC (U201). Included in the PA assembly, is a Low Pass Filter/Antenna Switch module used to suppress undesired harmonic frequency components and provide antenna switching for the receiver and the transmitter.

SUPPLY VOLTAGE

Supply voltage for the PA is connected through power leads from the system board to feed through capacitors C297 and C298 on the bottom of the PA assembly (See Schematic Diagram). C297, C298, and C299 prevent RF from getting on the power leads. Diode CR295 will cause the main fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

The PA assembly is insulated from vehicle ground to permit operation in positive or negative ground vehicles.

NOTE

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause on of the in-line fuses to blow.

Centralized metering jack J205 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the Ampl-1 drive (exciter output), power control voltage, PA current and PA voltage.

CIRCUIT ANALYSIS

RF POWER AMPLIFIER ASSEMBLY

The exciter output is coupled through a 50-ohm RF cable to the PA module input jack J201. The 50-ohm RF input is coupled through a matching network comprised of C206, C207, C208 and W202 to the base of power amplifier Q201.

Part of the RF input is rectified by CR201 and metreed at J205-4 through resistor R201. The rectified RF is also applied to the power contol IC (U201).

Collector voltage for Q201 is applied direct from the DC power input through collector stabilizing network R205 and L202 and collector feed network L203 and C210.

The 500 milliwatt, 50-ohm output of Q201 is coupled to the base of a second power amplifier Q202 through a matching network consisting of T201, C214, C215, C216 and L204.

Collector voltage to Q202 is controlled by power control IC (U201), Q215 and R213 and is applied through a collector stabilizing network L206 and R206 and collector feed network L205 and C218.

The 6 Watt, 50-ohm output of Q202 is coupled to the base of Driver Amplifier

PARTS LIST

LBI30202X

406-512 MHz EXCITER BOARD
19D419826G2 (L) 406-450 MHz
19D419826G4 (H) 450-512 MHz

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101	19A116080P101	Polyester 0.01 µf ±10%, 50 VDCW.
C102	19A342025P-	Tantalum 22 µf ±20%, 15 VDCW.
C103	19A342029P8	Tantalum 15 µf ±20%, 20 VDCW.
C104	19A342032P5	Tantalum 3.3 µf ±20%, 15 VDCW.
C105 and C106	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C107	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C108	19A116555P33	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C109	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C110	19A116555P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C112	19A700105P44	Mica: 220 pf ±5%, 500 VDCW.
C113	5496372P365	Ceramic disc: 470 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C114	19A342029P-	Tantalum: 22 µf ±20%, 15 VDCW.
C115	19A116555P33	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C116	5496372P379	Ceramic disc: 910 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C117	5496372P335	Ceramic disc: 470 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C118L	19A116656P30J8	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C118H	19A116656P27J8	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C119	19A700033P15	Phenolic: 1.5 pf ±5%, 500 VDCW.
C121L	19A116655P30J8	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C121H	19A116656P27J8	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C122L	19A116656P36J8	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -90 PPM.
C122H	19A116656P20J8	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C124	19A700105P34	Mica: 100 pf ±5%, 500 VDCW.
C125	19A116655P21	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C127 and C128	19A116655P21	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C131	5496401P118	Phenolic: 0.75 pf ±5%, 500 VDCW.
C132	19A116555P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C133	19A116655S7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C134 thru C139	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C137	19A700033P31	Phenolic: 0.68 pf ±5%, 500 VDCW.
C138L	19A116656P36J8	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -90 PPM.
C138H	19A116656P39J8	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -90 PPM.
C139	19A116655P23	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C141	19A116655P7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C142L	19A700105P26	Mica: 47 pf ±5%, 500 VDCW.
C142H	19A700105P23	Mica: 39 pf ±5%, 500 VDCW.
C144	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C145L	19A116656P22J8	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C145H	19A116656P15J8	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C146	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C147L	19A116656P30J8	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C147H	19A116656P15J8	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C148	19A116656P30J8	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C149	19A116655S7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C151	19A116655S7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C152L	19A116656P4J0	Ceramic disc: 4 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C152H	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C153*	19A134668P2	Silver mica: 22 pf ±5%, 500 VDCW; sim to Electro Motive Type DM15ED. Deleted by REV E.
C154	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C155	19A700G08P1	Variable, air: 2.04 to 9.8 pf; 250 VDCW; sim to EF Johnson Type T 187-0106-005.
C159*	19A700013P14	Phenolic: 1.2 pf ±5%, 500 VDCW.
		Is REV A & earlier:
	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C157	19A700008P1	Variable, air: 2.04 to 9.9 pf; 250 VDCW; sim to EF Johnson Type T 187-0106-005.
C161L	19A116656P6J8	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C161H	19A116655P5J8	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C162	19A116656P47J1	Ceramic disc. 47 pf ±5%, 500 VDCW, temp coef -150 PPM.
C163	19A116656P30J8	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C164	19A116655P7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C165	19A703105P14	Silver mica: 18 pf ±5%, 500 VDCW.
C166L	19A116656P4J0	Ceramic disc: 4 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C166H	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C167	19A700008P1	Variable, air: 2.04 to 9.8 pf; 250 VDCW; sim to EF Johnson Type T 187-0106-005.
C168	19A116653P47J1	Ceramic disc. 47 pf ±5%, 500 VDCW, temp coef -150 PPM.
C171	19A700008P1	Variable, air: 2.04 to 9.9 pf; 250 VDCW; sim to EF Johnson Type T 187-0106-005.
C172	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C175	19A700008P1	Variable, air: 2.04 to 9.9 pf; 250 VDCW; sim to EF Johnson Type T 187-0106-005.
C176	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C177	19A134202P6	Tantalum: 22 µf ±20%, 15 VDCW.
C178	19A116655P13	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C181 and C182	19A134202P6	Tantalum: 22 µf ±20%, 15 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C183	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C192L	19A116656P24J8	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C192H	19A116656P18J8	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C193L	19A116656P39J8	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C193H	19A116656P27J8	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C194L	19A116656P12J8	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -80 PPM.
C194H	19A116656P8J8	Ceramic disc: 8 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C195L	19A116656P9J8	Ceramic disc: 9 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C195H	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR101	5495769P9	Diode, silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J101	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14611413.
J103	19B219374G1	Connector: 9 contacts.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L101	19A130255P3	Coil.
L104	19A130255P2	Coil.
L105	19A130443P1	Coil.
L106L	19A130443P4	Coil.
L106H	19A130443P2	Coil.
L107	19A130255P2	Coil.
L108	19A130443P1	Coil.
L109	19A130443P3	Coil.
L111	19B209430P101	Coil, RF: 0.15 µh ±10%, 0.10 ohm DC res max; sim to Jeffers 4416-3.
L112	19A700024P9	Coil, RF: 470 nH ±10%, 0.35 ohms DC res max.
L113	19B209420P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4412-1.
L114	19A700024P9	Coil, RF: 470 nH ±10%, 0.35 ohms DC res max.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P902		Connector. Includes:
	19B219594P5	Contact, electrical: 8 pins.
	19B219594P9	Contact, electrical: 9 pins.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q101	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q102	19A115330P1	Silicon, NPN.
Q103	19A115324P1	Silicon, NPN.
Q104*	19A116899P1	Silicon, NPN; sim to Type 2N2358.
		Is REV B and earlier:
	19A115328P1	Silicon, NPN.
Q105 and Q106	19A116201P3	Silicon, NPN
Q107*	19A116201P4	Silicon, NPN.
		Earlier than REV A:
	19A116201P1	Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	19A700106P43	Composition: 1K ohms ±5%, 1/4 w.
R102	19A700106P53	Composition: 390 ohms ±10%, 1/4 w.
R103	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R104	19B209358P105	Variable, carbon film: approx 300 to 10K ohms ±5%, 0.25 w; sim to CTS Type X-201.
R105	19B209358P105	Variable, carbon film: approx 200 to 5K ohms ±10%, 0.25 w; sim to CTS Type X-201.
R106	3R152P104K	Composition: 100K ohms ±10%, 1/4 w.
R107	19A700106P43	Composition: 1K ohms ±5%, 1/4 w.
R108	3R152P682K	Composition: 68K ohms ±10%, 1/4 w.
R109*	3R152P431J	Composition: 430 ohms ±5%, 1/4 w.
		Is REV C & earlier:
	3R152P102J	Composition: 1K ohms ±5%, 1/4 w.
R110	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R111	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R112	3R157P474J	Composition: 470K ohms ±5%, 1/4 w.
R113 and R114	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R115	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R116	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R117	3R152P27JK	Composition: 27K ohms ±10%, 1/4 w.
R118	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R121*	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
		Is REV A & earlier:
	2R15.1P151J	Composition: 150 ohms ±5%, 1/4 w.
R122	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R123	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R125	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R126	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R127	19A116310P33	Composition: 22 ohms ±5%, 0.25 w; sim to Allen-Bradley Type CB.
R128	19A700106P35	Composition: 68 ohms ±5%, 1/4 w.
R129	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R131	3R151P221J	Composition: 220 ohms ±5%, 1/4 w.
R132	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R133	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R134	19A116310P37	Composition: 15 ohms ±5%, 0.25 w; sim to Allen-Bradley Type CB.
R135	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R137	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R138	19A700106P71	Composition: 2.2K ohms ±10%, 1/4 w.
R139	19A116310P39	Composition: 100 ohms ±5%, 1/4 w.
R140	19A116310P53	Composition: 10 ohms ±5%, 0.25 w; sim to Allen-Bradley Type CB.
R141	3R152P181J	Composition: 180 ohms ±5%, 1/4 w.
R142	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R143	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R144	19A700101P83	Composition: 6.8K ohms ±5%, 1/4 w.
R144	3R151P100K	Composition: 10 ohms ±10%, 1/8 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T101	19C307171P103	Coil, RF.
T102	19C307170P305	Coil, RF.
T103	19C307170P306	Coil, RF.
T104	19C307170P307	Coil, RF.
T105	19C307169P202	Coil, RF.
T106	19C307169P203	Coil, RF.

SYMBOL	GE PART NO.	DESCRIPTION
T107 and T108	19C307169P204	Coil, RF.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U103	19D416542G2	Transmitter, Audio.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY101 thru XY108	19A142706P1	Contact, electrical. (Quantity 8 each socket).
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z101*	19A134666P2	Frequency Select Network. Added by REV E.
		ASSOCIATED ASSEMBLIES
		- - - - - - - - - - OSCILLATORS - - - - - - - - - -
		NOTE: When reordering specify ICOM Frequency.
		ICOM FREQ= Operating Frequency - 54.
Y101 thru Y108	19A137763G15	Externally compensated, ±5 PPM, 406-512 MHz.
	19A137763G16	Externally compensated, ±5 PPM, 406-512 MHz.
	19A137763G21	Externally compensated, ±5 PPM, 406-512 MHz.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19C322143G1	Shield.
	19A129434G2	Clm. (Used with T101-T108).
	19A116707P3	Insulator, disc. (Used with Q105-Q107).

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To increase Power Output. Incorporate new transistor Q107.

REV. B - To increase Power Output. Changed R121 and C156.

REV. C - To improve operation. Changed Q104.

REV. D - To improve audio frequency response. Change R109.

REV. E - To incorporate new nomenclature for frequency selective networks. Deleted C153 and added Z101.

REV. F - To permit operation with the 19A137763 ICOM. Changed R143.

MOBILE RADIO

MAINTENANCE MANUAL

406—512 MHz, 40 WATT POWER AMPLIFIER ASSEMBLY

I9D424888G5-8, G22-25 AND G35, G36 (MOBILE & STATION)

I9D424895G5-8, G22-25 AND G36, G37 (CONTINUOUS DUTY STATION)

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PARTS LIST AND PRODUCTION CHANGES..... 6, 9 & 10

DESCRIPTION

The PA assembly uses four RF power transistors tp provide rated output power. R213, located on the PA module, is used to adjust the output power over a range of 12 Watts to rated output power. The power control circuit consists of R213, Q215, and Power Control IC (U201). Included in the PA assembly, is a Low Pass Filter/Antenna Switch module used to suppress undesired harmonic frequency components and provide antenna switching for the receiver and the transmitter.

SUPPLY VOLTAGE

Supply voltage for the PA is connected through power leads from the system board to feed through capacitors C297 and C298 on the bottom of the PA assembly (See Schematic Diagram). C297, C298, and C299 prevent RF from getting on the power leads. Diode CR295 will cause the main fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

The PA assembly is insulated from vehicle ground to permit operation in positive or negative ground vehicles.

NOTE

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause on of the in-line fuses to blow.

Centralized metering jack J205 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the Ampl-1 drive (exciter output), power control voltage, PA current and PA voltage.

CIRCUIT ANALYSIS

RF POWER AMPLIFIER ASSEMBLY

The exciter output is coupled through a 50-ohm RF cable to the PA module input jack J201. The 50-ohm RF input is coupled through a matching network comprised of C206, C207, C208 and W202 to the base of power amplifier Q201.

Part of the RF input is rectified by CR201 and metreed at J205-4 through resistor R201. The rectified RF is also applied to the power contol IC (U201).

Collector voltage for Q201 is applied direct from the DC power input through collector stabilizing network R205 and L202 and collector feed network L203 and C210.

The 500 milliwatt, 50-ohm output of Q201 is coupled to the base of a second power amplifier Q202 through a matching network consisting of T201, C214, C215, C216 and L204.

Collector voltage to Q202 is controlled by power control IC (U201), Q215 and R213 and is applied through a collector stabilizing network L206 and R206 and collector feed network L205 and C218.

The 6 Watt, 50-ohm output of Q202 is coupled to the base of Driver Amplifier

Q203 through C219 and the matching network of T202, C222, C224, C225 and L207. The collector voltage to Q203 is coupled through collector stabilizing network L209 and R214 and collector feed network L208 and C228.

The 20 Watt output of Q203 is coupled through an impedance matching network (C229, C230, C233 and T203) that matches the output impedance of Q203 to the input impedance of power amplifier Q204 through a 50-ohm micro strip (W204) and input impedance matching network T204, C234, C235 and C236.

The collector voltage for Q204 is coupled through collector stabilizing network L212 and R208 and collctor feed network C239 and L211. Supply voltage is measured in position F on the 15 volt range with the polarity switch in the (-) position (read as 15 Volts full scale).

Collector current for Q204 is metered across taped manganin resistor R212. The reading taken in position F on the 15 Volt scale with the High Sensitivity button pressed and read as 0-15 amperes full scale.

Following power amplifier Q204 to the 50-ohm input of the Low Pass Filter Module through 50-ohm micro stip W205 and a 50-ohm cable W218.

The input to the Low Pass Filter to the antenna switch K201 is coupled through the 50-ohm micro stirp W4280. The output is applied to the antenna at J203.

WARNING

The RF Power Transistor used in the transmitter contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

POWER CONTROL CIRCUIT

The Power Control Circuit, located on the PA module, consists of CR201, Power Control IC (U201), RT201, Q215 and R213.

When the transmitter is keyed, rectified RF from CR201 is applied to Switch Q1 of Power Control IC (U201), turning it on (See Figure 1). Turning on Q1 turns on voltage regulator Q2, supplying a constant voltage via Pin 14 to Power Adjust potentiometer R213. R213 through Pin 12 connect to the base of Q5. Q5. Q6 and Q215 operate as an amplifier chain to supply voltage to the collector of Q202 (Ampl-2). The setting of R213 determines the voltage applied to the base of Q5. The higher the voltage at the base of Q5, the harder the amplifiers conduct, supplying more collector voltage to Q202. The lower the voltage at the base of Q5, the less collector voltage is supplied to Q202. Reducing the supply voltage to Q202 reduces the drive to Q203 and Q204, thereby reducing the power output of the PA. The power output can be adjusted by R213 from 12 Watts to rated power output.

Temperature protection is provided by Q3, Q4 in IC U201 and thermistor RT201 which is mounted on the PA heatsink. Under normal operating conditions, the circuit is inactive (Q3 is on and Q4 is off). When the heatsink temperature reaches approximately 115°C the resistance of RT201 decreases. This increases the base voltage applied to Q3, turning it off. Turning off Q3 allows Q4 to turn on, decreasing the voltage at Power Adjust potentiometer R213. This reduces the base voltage to Q5 which causes Q6 and Q215 to conduct less, reducing the collector voltage to Q202 (Ampl-2). This reduces the transmitter output power, keeping the heatsink at a maximum of approximately 115°C. When the heatsink temperature decreases below 115°C, the temperature control circuit turns off, allowing the normal transmitter power output.

ANTENNA MATCHING UNIT

The Antenna Matching Unit is used only in continuous duty duplex stations to optimize impedance matching between the power amplifier and the load. It consists of a Pi network (C2-C5 and L1) and a reverse directional coupler. RF from the low pass filter is applied to the Pi network through the reverse directional coupler and then to the duplexer load. The reverse directional coupler permits monitoring the reflected power by connecting a DC voltmeter across TP1 (+) and ground (-). C2 and C4 are tuned for minimum DC voltage which represents reflected Power. L1 may also be pushed toward or away from the filter cover wall to further reduce the DC voltage. C2, C4, and L1 should be alternately tuned until an absolute minimum voltage reading is obtained. The residual voltage reading after tuning may vary from one transmitter to the next depending on output power level, operating frequency, and the load.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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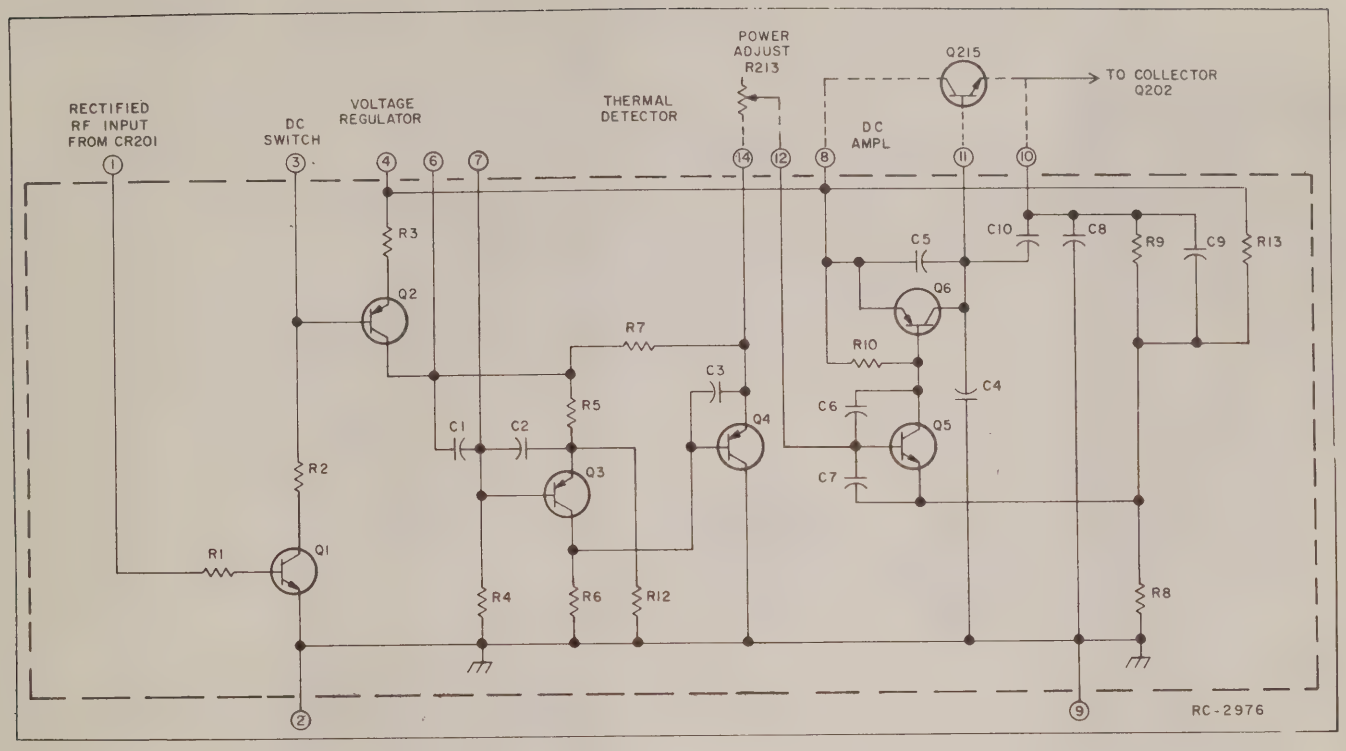
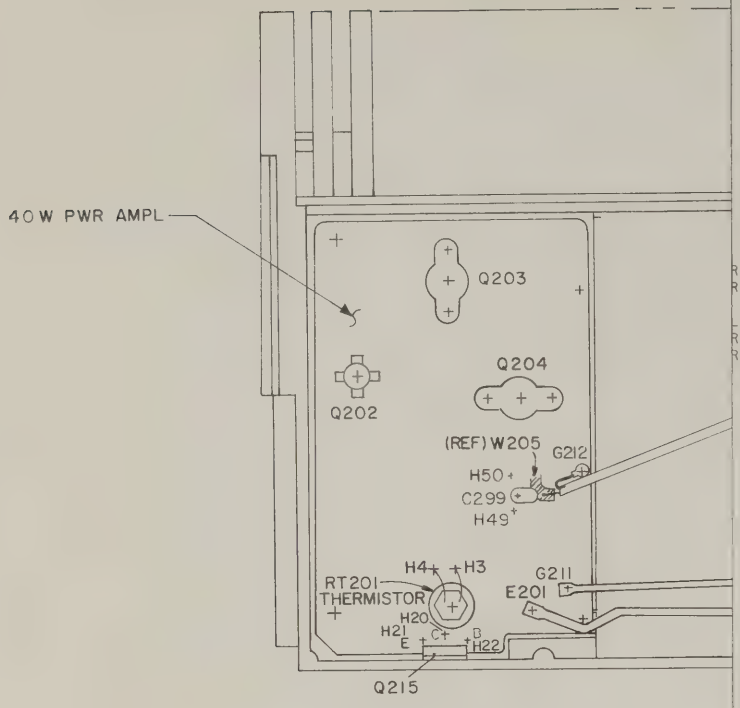


Figure 1 - Power Control IC - U201

PA ASSEM

TOP V



RENCE DESIGNATIONS
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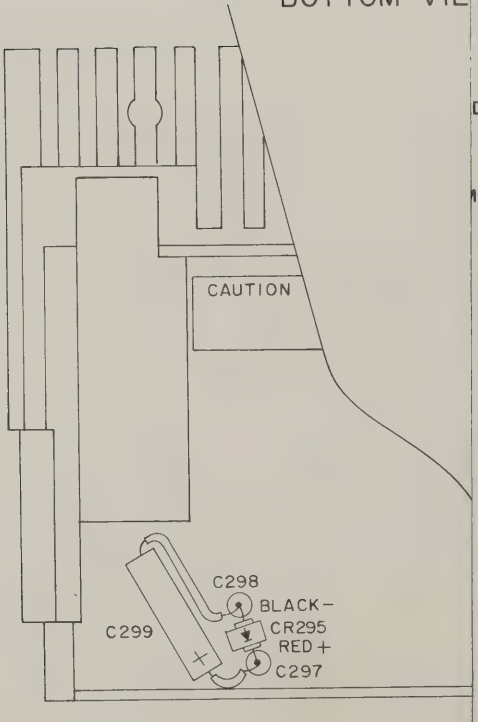
MTG HOLESFOR
8.

BOTTOM VIE



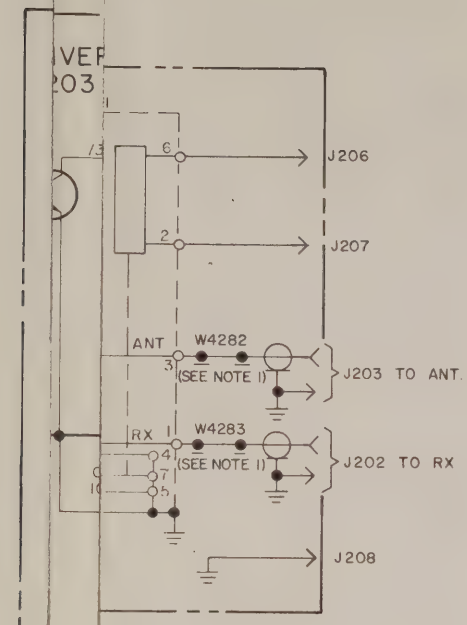
DER SIDE

MPONENT SIDE

OUTLINE DIAGRAM

(19D424207, Re

40 WATT POWER AMPLIFIER



ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

REQUENCY
-420 MHZ
-470 MHZ
-494 MHZ
-512 MHZ
-450 MHZ
-420 MHZ
-470 MHZ
-494 MHZ
-512 MHZ
-450 MHZ
STD. PKG
SYSTEM PKG
PL19

ROSTRIP PART OF PWB
COMPONENTS MARKED WITH (*)
TERISK, SEE COMPONENT VALUE
BLE
INDICATES A-
INDICATES VEHICLE GROUND.

16 USED ONLY IN 450-470MHZ RANGE.
52 NOT USED IN PL19C32134769.

*COMPONENT VALUES AS FOLLOWS

COMP IDENT	LL 406-450 MHZ	L 450-470 MHZ	M 470-494 MHZ	H 494-512 MHZ
C207	8	9	7	6
C208	8			
C213	5			
C215	47	47	43	43
C216	51	43	43	39
C217	18	16	15	13
C219	680	680	680	680
C224	41	35	35	32
C225	43	35	33	32
C226	47	43	37	35
C227	43	37	37	35
C236	47	35	33	33
C230	7		4	3
C235	47	37	35	33
C237	47	39	37	35
C238	47	43	43	39
C252	9	7	4	3
C257	5			
C4290	10	9	9	9
C4291	20	18	18	18
C4292	13	12	12	12
L210	15	5.6	5.6	5.6
Z203	X	X	X	X
Z204	X	X	X	X
Z205	X	X	X	X
Z207	X	X	X	X
Z208	X	X	X	X
Z209	X	X	X	X
Z210	X	X	X	X
Z211	X	X	X	X
Z213	X			
Z214	X			

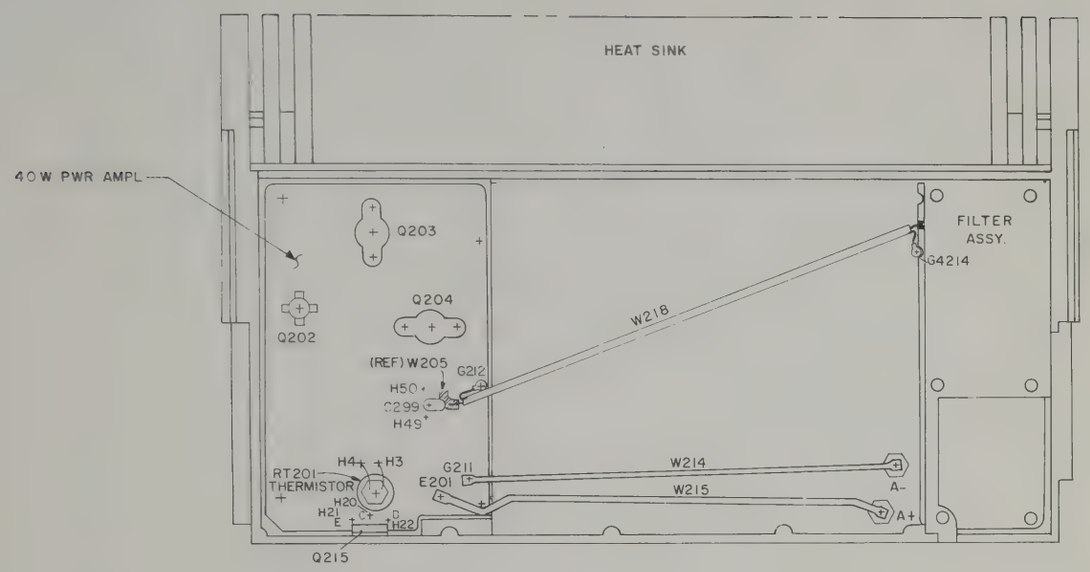
7. ON PL19C32134765 DELETE L207 & ADD Z213.
8. ON PL19C32134769 DELETE L210 & ADD Z214.

SCHEMATIC DIAGRAM

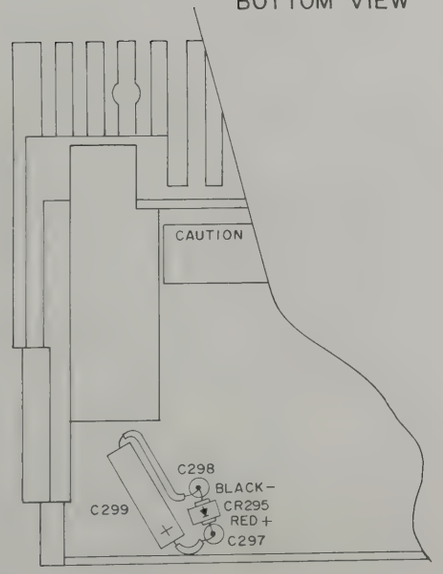
40 WATT POWER AMPLIFIER

PA ASSEMBLY

TOP VIEW



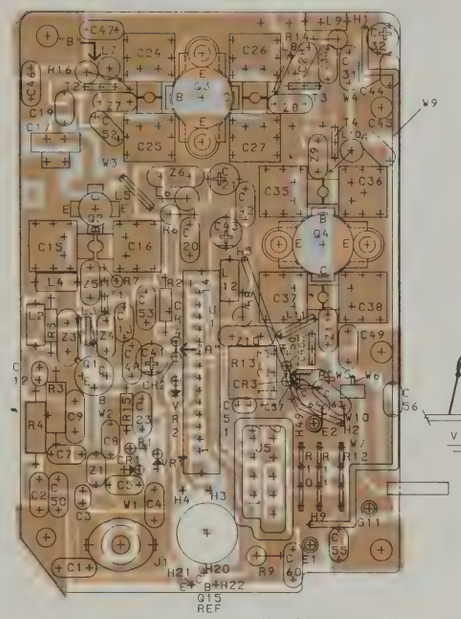
BOTTOM VIEW

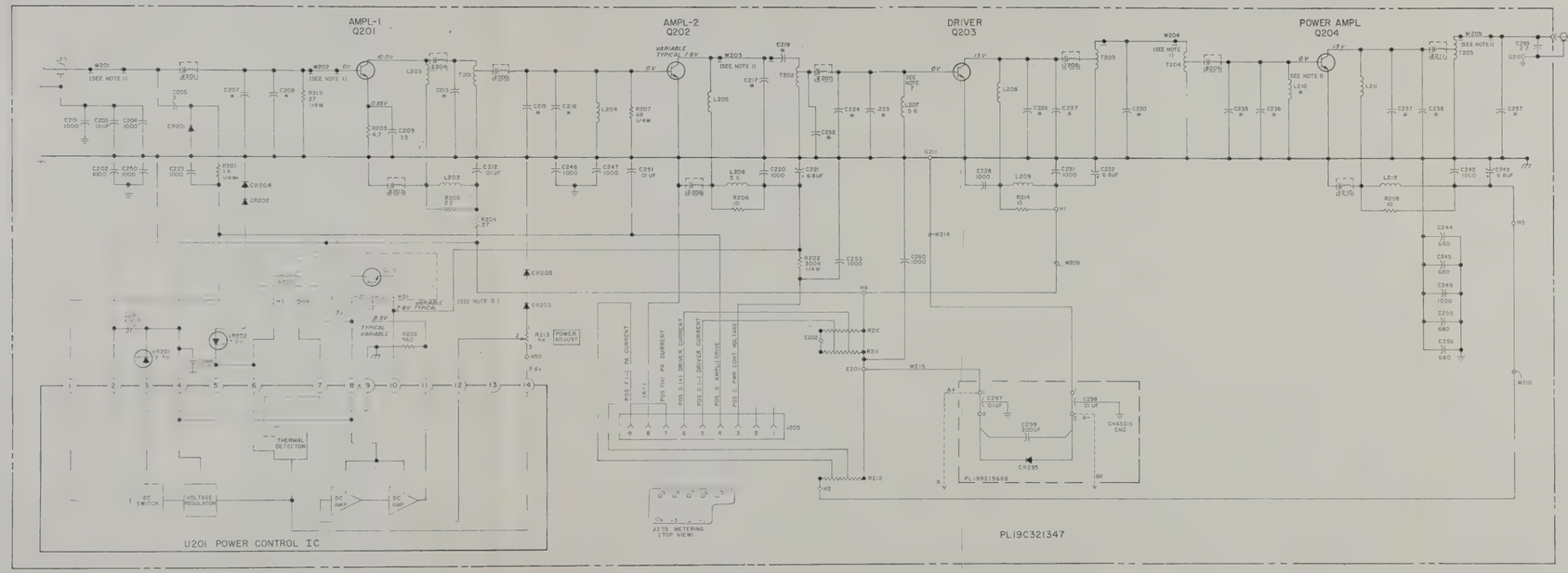


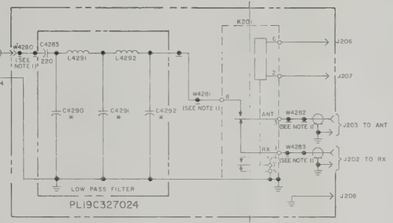
(19D424207, Rev. 2)

40 WATT PA MODULE

TOP







* COMPONENT VALUES AS FOLLOWS

COMP IDENT	L 406-450 MHZ	L 450-470 MHZ	M 470-494 MHZ	M 494-512 MHZ
C207	8	9	7	8
C208	8			
C213	5			
C215	47	47	43	43
C216	51	43	43	39
C217	18	16	15	13
C219	680	680	680	680
C224	41	35	35	35
C225	43	35	33	33
C226	47	43	37	35
C227	43	37	37	35
C236	47	35	33	31
C230	7		4	3
C235	47	37	35	33
C237	47	39	37	35
C238	47	43	43	39
C252	9	7	4	3
C257	5			
C4290	10	9	9	9
C4291	20	18	18	18
C4292	15	12	12	12
L210	15	5.6	5.6	5.6
R203	X	X	X	X
R205	X	X	X	X
R207	X	X	X	X
R208	X	X	X	X
R209	X	X	X	X
R210	X	X	X	X
R213	X			
R214	X			

PA ASSEMBLY	REV LTR	HEAT SINK ASM	REV LTR
PI19D424888G5	A	PI19B136857	
PL19D424888G6	B	PL19B136857	
PI19D424888G7	A	PL19B219688G7	
PL19D424888G8	A	PL19B219688G7	
PL19D424888G35		PL19B219688G7	
PL19D424888G22	A	PL19B219688G19	
PL19D424888G23	P	PL19B219688G19	
PL19D424888G24	A	PL19B219688G19	
PL19D424888G25	A	PL19B219688G19	
PL19D424888G3C		PL19B219688G19	

40 WATT MODULE	REV LTR	FILTER MODULE	REV LTR	FREQUENCY
PL19C321347G5	N	PL19C327024G1		406 -470 MHZ
PL19C321347G6	M	PL19C327024G2		450-470 MHZ
PL19C321347G7	H	PL19C327024G7		470-494 MHZ
PL19C321347G8	H	PL19C327024G8		494-512 MHZ
PL19C321347G9	F	PL19C327024G1		406-450 MHZ
PL19C321347G5	N	PL19C327024G1		406 - 420 MHZ
PL19C321347G6	M	PL19C327024G2		450 -470 MHZ
PL19C321347G7	H	PL19C327024G2		470-494 MHZ
PL19C321347G8	H	PL19C327024G2		494 - 512 MHZ
PL19C321347G9	F	PL19C327024G1		420-450 MHZ

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG = 1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS UNLESS FOLLOWED BY MMF=MICROMICROFARADS OR PF=PICOFARADS. INDUCTOR VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS, OHMITE=MIDOHMS

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH TRANSMITTER KEYED AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER. A-TH REFERENCE TO A- AND NOT CHASSIS GROUND. AN RF CHOKE (25 TO 50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS. NOTE READINGS AT Q202 COLLECTOR AND IN THE POWER CONTROL CIRCUIT WERE TAKEN WITH THE TRANSMITTER ADJUSTED FOR 40 WATTS OUTPUT. THESE READINGS WILL VARY DEPENDING ON THE SETTING OF POWER ADJUST CONTROL R213.

NOTES
1. MICROSTRIP PART OF PWB
2. ALL COMPONENTS MARKED WITH (8) ASTERISK SEE COMPONENT VALUE TABLE
3. ⏚ INDICATES A-
   ⏚ INDICATES VEHICLE GROUND
4.
5. R206 USED ONLY IN 450-470MHZ RANGE
6. C252 NOT USED IN PL19C321347G9.
7. ON PL19C321347G5 DELETE L207 & ADD #213
8. ON PL19C321347G5 DELETE L210 & ADD #214

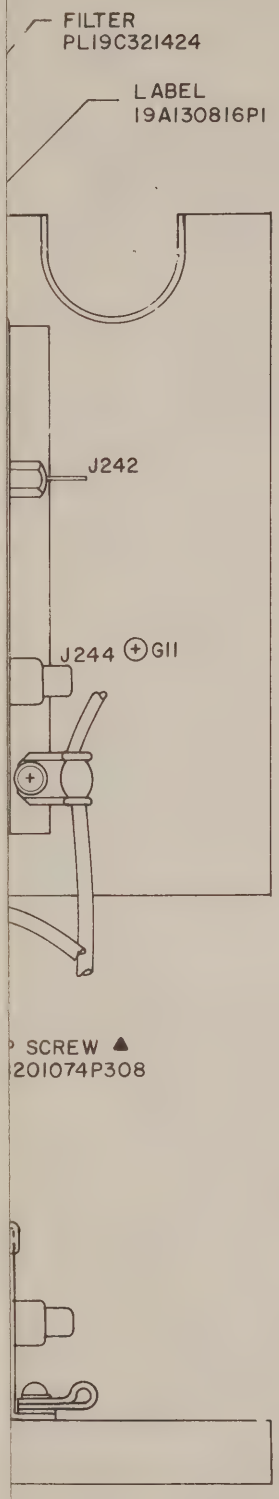
SCHEMATIC DIAGRAM
40 WATT POWER AMPLIFIER
Issue 7

	DESCRIPTION
	Strap.
	Jumper.
	Jumper.
	- - - - - - - - - - NETWORKS - - - - - - - - - -
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.

SYMBOL	GE PART NO.	DESCRIPTION
Z211M*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
Z211H*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
Z212*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
Z213* and Z214*		NETWORK ASSEMBLY 19A143581G1 (Added to G5 by REV M, G9 by REV E)
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A700024P1	Coil, RF: 100 nH ±10%, 0.08 ohms DC res max.
L2	19A129773G1	Coil.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A7000106P15	Composition: 10 ohms ±5%, 1/4 w.
		LOW PASS FILTER 19C327024G1 406-450 MHz (LL) 19C327024G2 450-512 MHz (H) (Added to 19D424888 by REV A)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4290LL	19A700014P4	Metallized teflon: 10 pf ±5%, 250 VDCW.
C4290H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW.
C4291LL	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW.
C4291H	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDCW.
C4292LL	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDCW.
C4292H	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW.
C4293	19A700015P37	Metallized teflon: 220 pf ±5%, 250 VDCW.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L4291LL	19B226709G2	Jumper. (Includes L4292LL).
L4291H	19B226709G1	Jumper. (Includes L4294H).
L4292LL		(Part of L4291LL).
L4292H		(Part of L4291H).
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J202 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J206 and J207	19A134263P2	Contact, electrical: sim to Selectro 229-1071.
J208	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K201	19A700061P1	Hermetic sealed: 180-341 ohms coil res, 8-16.3 VDC; sim to GE 3SAV1760A2, CP Clare HFW-1201558, or Potter-Brumfield HCM6160.
		- - - - - - - - - - CABLES - - - - - - - - - -
W4280 thru W4283		(Part of printed board 19D424812P1).
		LOW PASS FILTER MODULE 19C321424G1 406-450 MHz (LL) 19C321424G2 450-512 MHz (H) (Deleted on 19D424888 by REV A)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4280LL	19A700014P1	Metallized teflon: 10 pf ±5%, 250 VDCW.
C4280H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW.
C4281LL	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW.
C4281H	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDCW.
C4282LL	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDCW.
C4282H	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW.

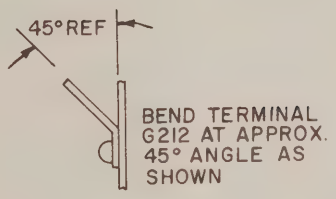
(Cont'd on Page 7)

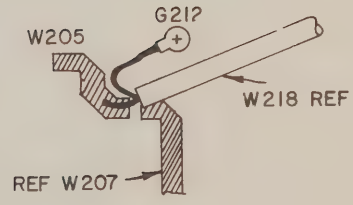
40 W UHF PA



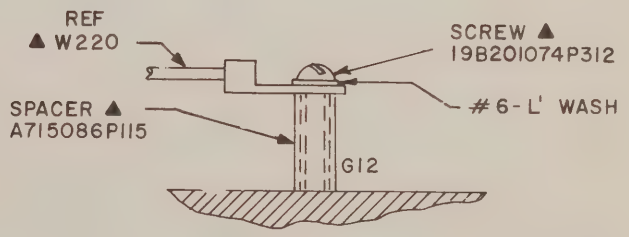
NOTES:

1. ▲ PART OF KIT 19A130484.
2. CENTER CONDUCTOR OF W218 MUST BE SOLDERED TO W205 IN AREA INDICATED. NOTE: GROUND BRAID OF W218 MUST NOT TOUCH GROUND ON 40W MODULE (19C321347).
3. APPLY SILICONE GREASE TO BOTH SURFACES OF TRANSISTOR INSULATOR (19A116023P1), BETWEEN BOTH MTG SURFACES OF SPACER (19A130465P1) & BETWEEN MTG. SURFACE OF RT201 Q203, Q204 & HEAT SINK PER CPD PROCESS P6A-EA111. CARE MUST BE USED SO THAT NO GREASE IS APPLIED TO THE THREADED PORTION OF THE MTG. STUD OF Q202.
4. SOLDER ALL ELECTRICAL CONNECTIONS.
5. TIGHTEN TRANSISTOR MTG. HARDWARE TO WITHIN 8 ± 1 IN. LBS. FOR #8 HARDWARE & 6 ± 1 IN. LBS. FOR #4 HARDWARE.
6. RECOMMENDED INSTALLATION PROCEDURE OF 40 WATT MODULE (19C321347) IS:
   ASSEMBLE ALL HARDWARE LOOSE THEN TORQUE Q202, THEN TORQUE Q203 AND Q204 THEN TIGHTEN MOUNTING HARDWARE.
7. SEE INTERCONNECTION DIAG 19R622186.





VIEW "C"



SECTION D-D

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OUTLINE DIAGRAM

CONTINUOUS DUTY STATION POWER AMPLIFIER AND ANTENNA MATCHING UNIT

PARTS LIST

LBI-30214G

406-512 MHz, 40 WATT POWER AMPLIFIER
19D434888G1-G8, G35 ("A" SERIES MODELS, 1ST. DUTY STATION)
19D434888G21-G28, G36 ("A" SERIES MODELS)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1969*	19A136100P30	Ceramic disc: 2.5 pf ±0.1 pf, 100 VDCW, temp coef 0 ±120 PPM/°C. Added to G6 & G23 by REF B.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1001	7578435P2	Terminal, lug.
E1002	7578435P2	Terminal, lug.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1001	19A116742P1	Silicon, NPN.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1001	19A128378G1	Thermistor: 40K ohms ±20%, color code white; sim to Carborundum Type WG002-75.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1001	19B226725G1	Jumper.
W1002	19B237974G1	Jumper.
W1003	19A130553G1	Jumper.

40 WATT MODULE
19C322347G8 406-420 MHz (LL)
19C322347G6 450-470 MHz (LJ)
19C322347G7 470-494 MHz (MJ)
19C322347G8 494-512 MHz (LJ)
19C322347G9 420-450 MHz (LJ)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2001 thru C2003	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2004	19A116639P21	Ceramic: 0.01 pf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C2005	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2006	19A116658P30	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2007*	19A116658P33	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM15AC. Deleted in G8 by REF A. Deleted in G8 by REF B.
C2008*	19A136468P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM15AC. Deleted in G8 by REF B. Deleted in G8 by REF D.
C2009	19A116655P47	Metallized teflon: 47 pf ±2%, 350 VDCW.
C2010	19A116655P47	Metallized teflon: 47 pf ±2%, 350 VDCW. Deleted in G8 by REF B.
C2011	19A116655P43	Metallized teflon: 43 pf ±2%, 350 VDCW.
C2012	19A116655P51	Metallized teflon: 51 pf ±2%, 350 VDCW.
C2013	19A116655P43	Metallized teflon: 43 pf ±2%, 350 VDCW.
C2014	19A116655P39	Metallized teflon: 39 pf ±2%, 350 VDCW.
C2015	19A116655P33	Metallized teflon: 33 pf ±2%, 350 VDCW.
C2016	19A116655P27	Metallized teflon: 27 pf ±2%, 350 VDCW.
C2017	19A116679P18D	Metallized teflon: 18 pf ±.5 pf, 250 VDCW.
C2018	19A116679P15D	Metallized teflon: 15 pf ±.5 pf, 250 VDCW.
C2019	19A116679P13D	Metallized teflon: 13 pf ±.5 pf, 250 VDCW.
C2020	19A116655P10	Ceramic disc: 10 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap. Deleted in G8 by REF A. Deleted in G7, G8 by REF B. Deleted in G8 by REF D.
C2021	19A116655P18	Ceramic disc: 18 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2022	19A116655P20	Ceramic disc: 20 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2023	19A116655P22	Ceramic disc: 22 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2024	19A116655P24	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2025	19A116655P27	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2026	19A116655P30	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2027	19A116655P33	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2028	19A116655P36	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2029	19A116655P39	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2030	19A116655P43	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2031	19A116655P47	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2032	19A116655P51	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2033	19A116655P56	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2034	19A116655P62	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2035	19A116655P68	Ceramic disc: 68 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2036	19A116655P75	Ceramic disc: 75 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2037	19A116655P82	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2038	19A116655P91	Ceramic disc: 91 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2039	19A116655P100	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2040	19A116655P110	Ceramic disc: 110 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2041	19A116655P120	Ceramic disc: 120 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2042	19A116655P130	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2043	19A116655P150	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2044	19A116655P160	Ceramic disc: 160 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2045	19A116655P180	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2046 thru C2049	19A116655P200	Ceramic disc: 200 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2050	19A116655P220	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2051	19A116655P240	Ceramic disc: 240 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2052	19A116655P270	Ceramic disc: 270 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2053	19A116655P300	Ceramic disc: 300 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2054	19A116655P330	Ceramic disc: 330 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2055	19A116655P360	Ceramic disc: 360 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2056	19A116655P390	Ceramic disc: 390 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2057	19A116655P430	Ceramic disc: 430 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2058	19A116655P470	Ceramic disc: 470 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2059	19A116655P510	Ceramic disc: 510 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2060	19A116655P560	Ceramic disc: 560 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2061	19A116655P620	Ceramic disc: 620 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2062	19A116655P680	Ceramic disc: 680 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2063	19A116655P750	Ceramic disc: 750 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2064	19A116655P820	Ceramic disc: 820 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2065	19A116655P910	Ceramic disc: 910 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2066	19A116655P1000	Ceramic disc: 1000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2067	19A116655P1100	Ceramic disc: 1100 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2068	19A116655P1200	Ceramic disc: 1200 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2069	19A116655P1300	Ceramic disc: 1300 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2070	19A116655P1500	Ceramic disc: 1500 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2071	19A116655P1600	Ceramic disc: 1600 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2072	19A116655P1800	Ceramic disc: 1800 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2073	19A116655P2000	Ceramic disc: 2000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2074	19A116655P2200	Ceramic disc: 2200 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2075	19A116655P2400	Ceramic disc: 2400 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2076	19A116655P2700	Ceramic disc: 2700 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2077	19A116655P3000	Ceramic disc: 3000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2078	19A116655P3300	Ceramic disc: 3300 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2079	19A116655P3600	Ceramic disc: 3600 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2080	19A116655P3900	Ceramic disc: 3900 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2081	19A116655P4300	Ceramic disc: 4300 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2082	19A116655P4700	Ceramic disc: 4700 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2083	19A116655P5100	Ceramic disc: 5100 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2084	19A116655P5600	Ceramic disc: 5600 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2085	19A116655P6200	Ceramic disc: 6200 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2086	19A116655P6800	Ceramic disc: 6800 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2087	19A116655P7500	Ceramic disc: 7500 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2088	19A116655P8200	Ceramic disc: 8200 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2089	19A116655P9100	Ceramic disc: 9100 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2090	19A116655P10000	Ceramic disc: 10000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2091	19A116655P11000	Ceramic disc: 11000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2092	19A116655P12000	Ceramic disc: 12000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2093	19A116655P13000	Ceramic disc: 13000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2094	19A116655P15000	Ceramic disc: 15000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2095	19A116655P16000	Ceramic disc: 16000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2096	19A116655P18000	Ceramic disc: 18000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2097	19A116655P20000	Ceramic disc: 20000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2098	19A116655P22000	Ceramic disc: 22000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2099	19A116655P24000	Ceramic disc: 24000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2100	19A116655P27000	Ceramic disc: 27000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2101	19A116655P30000	Ceramic disc: 30000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2102	19A116655P33000	Ceramic disc: 33000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2103	19A116655P36000	Ceramic disc: 36000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2104	19A116655P39000	Ceramic disc: 39000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2105	19A116655P43000	Ceramic disc: 43000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2106	19A116655P47000	Ceramic disc: 47000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2107	19A116655P51000	Ceramic disc: 51000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2108	19A116655P56000	Ceramic disc: 56000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2109	19A116655P62000	Ceramic disc: 62000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2110	19A116655P68000	Ceramic disc: 68000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2111	19A116655P75000	Ceramic disc: 75000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2112	19A116655P82000	Ceramic disc: 82000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2113	19A116655P91000	Ceramic disc: 91000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2114	19A116655P100000	Ceramic disc: 100000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2115	19A116655P110000	Ceramic disc: 110000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2116	19A116655P120000	Ceramic disc: 120000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2117	19A116655P130000	Ceramic disc: 130000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2118	19A116655P150000	Ceramic disc: 150000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2119	19A116655P160000	Ceramic disc: 160000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2120	19A116655P180000	Ceramic disc: 180000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2121	19A116655P200000	Ceramic disc: 200000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2122	19A116655P220000	Ceramic disc: 220000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2123	19A116655P240000	Ceramic disc: 240000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2124	19A116655P270000	Ceramic disc: 270000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2125	19A116655P300000	Ceramic disc: 300000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2126	19A116655P330000	Ceramic disc: 330000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2127	19A116655P360000	Ceramic disc: 360000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2128	19A116655P390000	Ceramic disc: 390000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2129	19A116655P430000	Ceramic disc: 430000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2130	19A116655P470000	Ceramic disc: 470000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2131	19A116655P510000	Ceramic disc: 510000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2132	19A116655P560000	Ceramic disc: 560000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2133	19A116655P620000	Ceramic disc: 620000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2134	19A116655P680000	Ceramic disc: 680000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2135	19A116655P750000	Ceramic disc: 750000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2136	19A116655P820000	Ceramic disc: 820000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2137	19A116655P910000	Ceramic disc: 910000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2138	19A116655P1000000	Ceramic disc: 1000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2139	19A116655P1100000	Ceramic disc: 1100000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2140	19A116655P1200000	Ceramic disc: 1200000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2141	19A116655P1300000	Ceramic disc: 1300000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2142	19A116655P1500000	Ceramic disc: 1500000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2143	19A116655P1600000	Ceramic disc: 1600000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2144	19A116655P1800000	Ceramic disc: 1800000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2145	19A116655P2000000	Ceramic disc: 2000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2146	19A116655P2200000	Ceramic disc: 2200000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2147	19A116655P2400000	Ceramic disc: 2400000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2148	19A116655P2700000	Ceramic disc: 2700000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2149	19A116655P3000000	Ceramic disc: 3000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2150	19A116655P3300000	Ceramic disc: 3300000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2151	19A116655P3600000	Ceramic disc: 3600000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2152	19A116655P3900000	Ceramic disc: 3900000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2153	19A116655P4300000	Ceramic disc: 4300000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2154	19A116655P4700000	Ceramic disc: 4700000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2155	19A116655P5100000	Ceramic disc: 5100000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2156	19A116655P5600000	Ceramic disc: 5600000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2157	19A116655P6200000	Ceramic disc: 6200000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2158	19A116655P6800000	Ceramic disc: 6800000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2159	19A116655P7500000	Ceramic disc: 7500000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2160	19A116655P8200000	Ceramic disc: 8200000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2161	19A116655P9100000	Ceramic disc: 9100000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2162	19A116655P10000000	Ceramic disc: 10000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2163	19A116655P11000000	Ceramic disc: 11000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2164	19A116655P12000000	Ceramic disc: 12000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2165	19A116655P13000000	Ceramic disc: 13000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2166	19A116655P15000000	Ceramic disc: 15000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2167	19A116655P16000000	Ceramic disc: 16000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2168	19A116655P18000000	Ceramic disc: 18000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2169	19A116655P20000000	Ceramic disc: 20000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2170	19A116655P22000000	Ceramic disc: 22000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2171	19A116655P24000000	Ceramic disc: 24000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2172	19A116655P27000000	Ceramic disc: 27000000 pf ±5%, 500 VDCW, temp coef 0 PPM. Deleted in G8 by REF A. Deleted in G7 by REF B. Deleted in G8 by REF D.
C2173	19A116655P30000000	Ceramic disc: 30000000 pf ±5%, 500

SYMBOL	GE PART NO.	DESCRIPTION
C4383LL	19A700015P57	Metallized teflon: 220 pf ±5%, 250 VDCW.
C4383B	19A700015P57	Metallized teflon: 220 pf ±5%, 250 VDCW.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L4299	19B226709G1	Jumper. (450-512 MHz).
L4299	19B226709G2	Jumper. (406-450 MHz).
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J201, J202 and J203	19A130834G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14S1163.
J201, J202 and J203		(Part of E201).
J201 and J203	4033113P4	Contact, electrical: sim to Bead Chain LB3-3.
		- - - - - - - - - - - RELAYS - - - - - - - - - -
K2xx	19A116732P1	Hermetic sealed: 125 ohms ±20%, 1 form C contact, 9.6 to 13.8 VDC (over the temp range indicated), (includes J206 & J207).
		- - - - - - - - - - CABLES - - - - - - - - - -
W4,W5, W6, W8,W11		(Part of printed board 19D433368P1).
		HEAT SINK 19B219588G7 "K" SERIES 19B219588G19 "E" SERIES
		- - - - - - - - - CAPACITORS - - - - - - - - -
C209 and C295	19A116706P1	Ceramic, feed-thru: 0.01 µf ±10%-0%: sim to Erie Style 327DG4-S4D103F.
C298	19A115480P10	Electrolytic: 200 µf +50%-10%, 18 VDCW; sim to Mallory Type TT4.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR295	19A116783P1	Rectifier, silicon: 100 VDC blocking, 6 amps.
		- - - - - - - - - HARDWARE - - - - - - - - -
	5492178P2	Washer, spring tension: sim to Wallace Barnes 175-02. (Used with Q202).
	19A130465P1	Spacer. (Used with Q203).
	#2079P3C6	Nut, hex: No. 8-32. (Used with Q202).
	#6429P010C6	Screw, machine: No. 6-40 x 5/8. (Used with Q203, Q204).
	19A136018P1	Insulator, bushing. (Used with Q215).
	19A116903P1	Insulator, plate. (Used with Q215).
	19B201074P312	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/4. (Secures Mobile Filter Assembly).
	19B201074P306	Tap screw, Phillips POZIDRIV®: No. 8-32 x 3/8. (Secures Filter Board).
	19C332161P1	Insulator. (Located under 40 watt Module).
	19D416723G7	Heat sink. ("K" SERIES).
	19D417105G7	Heat sink. ("E" SERIES).
	19A129629P1	Cover, Heat Sink Assembly. ("E" SERIES).
	4036555P1	Insulator, washer: nylon. (Used with Q201).
	#8GP9006C6	Machine screw: No. 4-40 x 3/8. (Secures Q215 to Module).
	7141225P2	Hex nut: No. 4-40. (Secures Q215).
	#6GP9S6C6	Washer, steel: No. 4. (Secures Q215).
	#8GP13010C6	Machine screw: No. 6-32 x 5/8. (Secures Mobile 40 Watt Module).

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions

REV. A - PA Assembly 19D424888G3-G8, G93-G95
To incorporate new low-pass filter. Deleted 19C321424. Added 19C321764.

REV. A - 40 Watt Module 19C321347G5-G8
To improve power output at cold temperatures. Added CR204 & CR205.

REV. B - 40 Watt Module 19C321347G5-G8
To improve operation.
In 19C321347G5: deleted C213 and changed C212LL.
In 19C321347G6: deleted C2331, C2376 and added C2321LL.
In 19C321347G7: deleted C2378 and added C2328B.
In 19C321347G8: deleted C2328, C2378 and added C2328B.

REV. C - 40 Watt Module 19C321347G5-G8
To improve operation. Deleted C209 and R303. Changed R204.

REV. D - 40 Watt Module 19C321347G5
To improve operation. Added C209 and R303.

REV. L - 40 Watt Module 19C321347G5
To improve station operation. Added C213.

REV. D - 40 Watt Module 19C321347G6-G8
To improve operation. Changed C206.

REV. F - 40 Watt Module 19C321347G5
To improve operation. Changed C206.

REV. E - 40 Watt Module 19C321347G7, G8
To improve RF output and efficiency. Changed C237 (Group 8) and C238 (Groups 7 & 8).

REV. L - 40 Watt Module 19C321347G5
REV. E - 40 Watt Module 19C321347G6
REV. F - 40 Watt Module 19C321347G7, G8
To decrease spurious outputs. Changed C207L, M and C209. Deleted C208L, M, N. Added R203 to Groups 6, 7 and 8.

REV. H - 40 Watt Module 19C321347G5
To increase output at 406 MHz. Changed C232LLB. Deleted C239. Added C239LLB.

REV. J - To improve stability. Changed Q207LL.

REV. F - 40 Watt Module 19C321347G6
To improve stability. Added R216 and C262.

REV. G - To improve operation. Deleted C263.

REV. A - 40 Watt Module 19C321347G9
To improve operation. Added C240LL.

REV. B - To improve stability. Changed Q203LL.

REV. K - 40 Watt Module 19C321347G5
REV. N - 40 Watt Module 19C321347G8
REV. G - 40 Watt Module 19C321347G7
REV. G - 40 Watt Module 19C321347G8

REV. C - 40 Watt Module 19C321347G8
To improve operation of power regulator circuit when used as driver for 100 Watt PA. Added C263 and C264.

REV. J - 40 Watt Module 19C321347G6
To increase output power at low end of 450-470 MHz range. Changed C232.

REV. L - 40 Watt Module 19C321347G5
REV. K - 40 Watt Module 19C321347G6
REV. N - 40 Watt Module 19C321347G7
REV. H - 40 Watt Module 19C321347G8
REV. D - 40 Watt Module 19C321347G8
To incorporate new nomenclature for frequency selection networks.

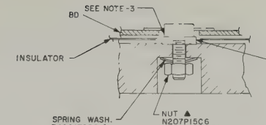
REV. B - PA Assembly 19D424889G5, G23
To improve power output. Added C299.

REV. H - 40-Watt Module 19C321347G5
REV. E - 40-Watt Module 19C321347G9
To improve power output across the board. Deleted C213LL, L207, and L210LL. Added Z213 and Z214. Changed C237LL, C238LB (Group 5 only), and Q203LLB.

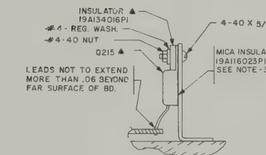
REV. M - 40-Watt Module 19C321347G5
REV. F - 40-Watt Module 19C321347G9
To improve power output. Changed C230LL, C235LL, C236LL and C297LL. Added C213LL.

REV. L - 40-Watt Module 19C321347G6
To increase power output. Changed C232LB and C237. Deleted R216 and C250.

REV. M - 40-Watt Module 19C321347G6
To improve power output over the 450-470 MHz range. Changed C219L and C232L.

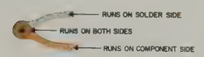


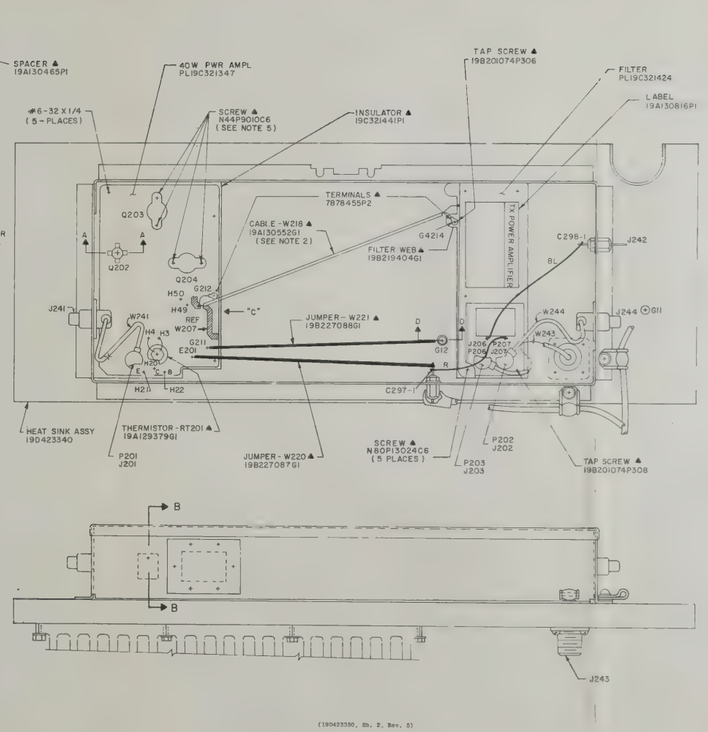
SECTION A-A
TYP MTG FOR Q202
(SEE NOTE 3)


INSULATOR ▲ 19A134016P1
#6 REG. WASH.
#4-40 NUT
Q215 ▲
LEADS NOT TO EXTEND MORE THAN .06 BEYOND FAR SURFACE OF BD.
4-40 X 5/16
MICA INSULATOR ▲ 19A116023P1 ▲
SEE NOTE-3

SECTION B-B

(19B233800, Rev. 0)
(19A143300, Sh. 1, Rev. 0)
(19A143300, Sh. 2, Rev. 0)





(190423350, Sh. 2, Rev. 5)

LBI30213

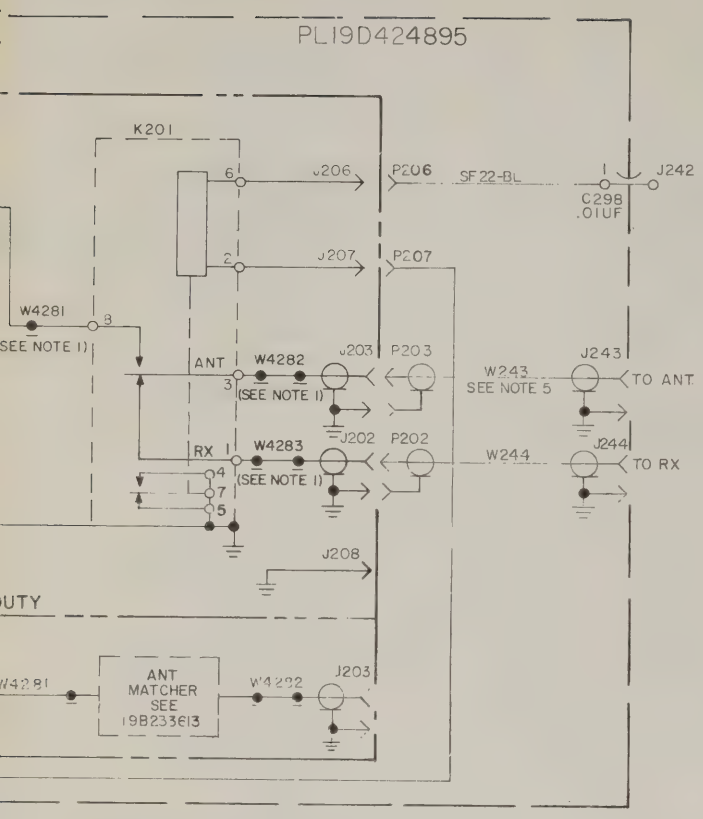
40W UHF PA

(2) NOTES
1. ▲ PART OF KIT 19A130484
2. CENTER CONDUCTOR OF #218 MUST BE SOLDERED TO #205 IN AREA INDICATED. NOTE: GROUND BRAID OF #218 MUST NOT TOUCH GROUND ON 40W MODULE (19C321347).
3. APPLY SILICONE GREASE TO BOTH SURFACES OF TRANSISTOR INSULATOR (19A116023P1) BETWEEN BOTH MTG SURFACES OF SPACER (19A130465P1) & BETWEEN MTG SURFACE OF RT201, Q203, Q204 & HEAT SINK (PER CPD PROCESS P6A-EA11). CARE MUST BE USED SO THAT NO GREASE IS APPLIED TO THE THREADED PORTION OF THE MTG. STUD OF Q202.
4. SOLDER ALL ELECTRICAL CONNECTIONS.
5. TIGHTEN TRANSISTOR MTG. HARDWARE TO WITHIN 8 ± 1 IN. LBS. FOR 8 HARDWARE & 6 ± 1 IN. LBS. FOR 4 HARDWARE.
6. RECOMMENDED INSTALLATION PROCEDURE OF 40 WATT MODULE (19C321347) IS:
ASSEMBLE ALL HARDWARE LOOSE THEN: TORQUE Q202, THEN TORQUE Q203 AND Q204 THEN TIGHTEN MOUNTING HARDWARE
7. SEE INTERCONNECTION DIAG. 19B227189.

SECTION D-D

OUTLINE DIAGRAM

CONTINUOUS DUTY STATION POWER AMPLIFIER AND ANTENNA MATCHING UNIT



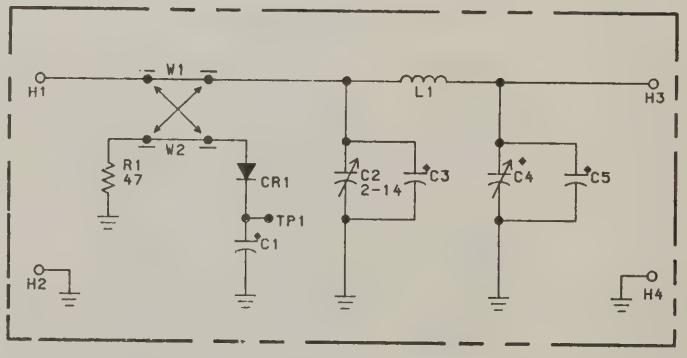
	REV LTR
5G36	A
5G37	B

	REV LTR	FREQUENCY	
		406-420 MHZ	
		450-470 MHZ	
		470-494 MHZ	
		494-512 MHZ	
		420-450 MHZ	
		406-420 MHZ	DUPLEX
		450-470 MHZ	
		470-494 MHZ	
		494-512 MHZ	
		420-450 MHZ	

✱COMPONENT VALUES AS FOLLOWS

COMP IDENT	LL 406-450 MHZ	L 450-470 MHZ	M 470-494 MHZ	H 494-512 MHZ
C207	8	9	7	6
C208	8			
C213	5			
C215	47	47	43	43
C216	51	43	43	39
C217	18	16	15	13
C219	680	680	680	680
C224	41	35	35	32
C225	43	35	33	32
C226	47	43	37	35
C227	43	37	37	35
C230	7		4	3
C235	47	37	35	33
C236	47	35	33	33
C237	47	39	37	35
C238	47	43	43	39
C252	9	7	4	3
C257	5			
C4290	10	9	9	9
C4291	20	18	18	18
C4292	13	12	12	12
L210	15	5.6	5.6	5.6
Z203	X	X	X	X
Z204	X	X	X	X
Z205	X	X	X	X
Z207	X	X	X	X
Z208	X	X	X	X
Z209	X	X	X	X
Z210	X	X	X	X
Z211	X	X	X	X
Z213	X			
Z214	X			

ANTENNA MATCHING UNIT



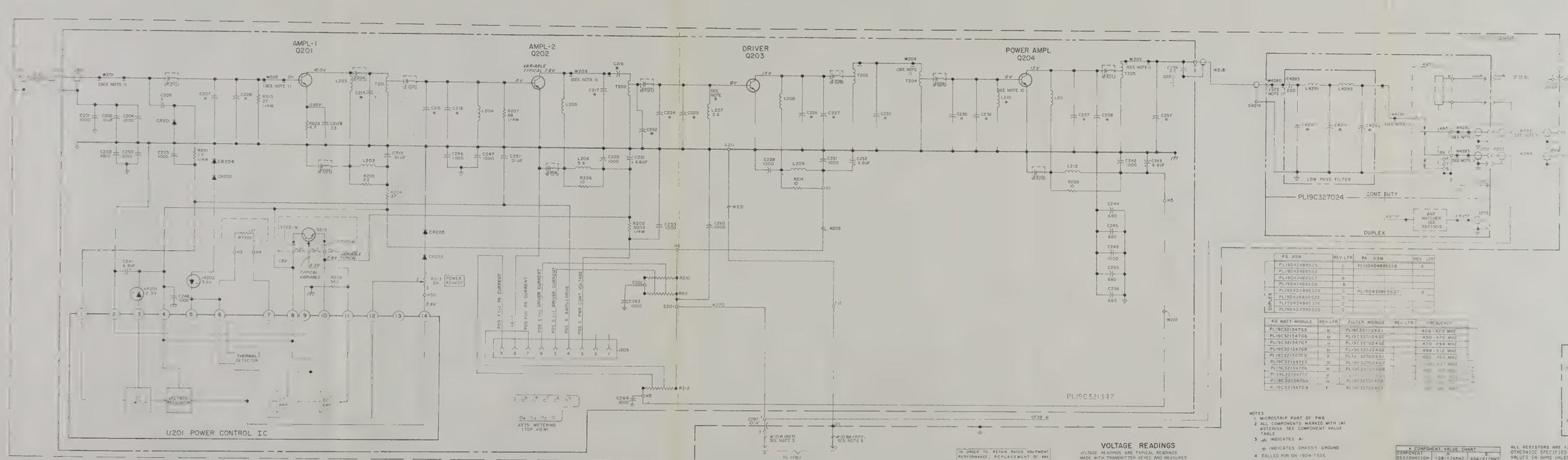
✱ COMPONENT VALUE CHART		
COMPONENT DESIGNATION	A 138-174MHZ	B 406-512MHZ
C1	1000	470
C4	2-14	2-10
C3	15	
C5	10	

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

MODEL NO.	REV. LETTER
19C33077861	
19C33077862	
19C33077863	

SYMBOL	GE PART NO.	DESCRIPTION
R210 thru R212	19C320212P1	Shunt resistor.
R213	19A116559P102	Variable, cermet: 5K ohms ±20%, .5 w; sim to CTS Series 360.
R214	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R215	19A700106P25	Composition: 27 ohms ±5%, 1/4 w.
R216*	19A700113P15	Composition: 10 ohms ±5%, 1/2 w. Added to G6 by REV F. Deleted by REV L.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T201 thru T205	19A130446G1	Coil.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U201	19D423127G1	Power Control.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR201	4036887P1	Zener: 500 mW, 2.3 v. nom.
VR202	4036887P5	Zener: 500 mW, 5.4 v. nom.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W201 thru W205		(Part of printed board 19D423005P1).
W206	19A129571P2	Strap.
W209	19B226733G1	Jumper.
W210	19B226734G1	Jumper.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z201*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
Z203LL*	19A134666P3	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
Z203L*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
Z203M*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
Z203H*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
Z204LL*	19A134666P3	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
Z204L*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
Z204M*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
Z204H*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
Z205LL*	19A134666P3	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
Z205L*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
Z205M*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
Z205H*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.
Z206*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G6 by REV K. Added to G7, G8 by REV H. Added to G9 by REV D.
Z207LL*	19A134666P3	Silver mica: 27 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G5 by REV L. Added to G9 by REV D.
Z207L*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G6 by REV K.
Z207M*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G7 by REV H.
Z207H*	19A134666P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Added to G8 by REV H.

(Cont'd on Page 10)



SCHEMATIC DIAGRAM

CONTINUOUS DUTY STATION POWER AMPLIFIER
AND ANTENNA MATCHING UNIT

* COMPONENT VALUES AS FOLLOWS

COMP IDENT	L1 406-450 MHZ	L 450-470 MHZ	M 470-494 MHZ	H 494-512 MHZ
C207	8	9	7	6
C208	8	-	-	-
C215	47	47	43	43
C216	51	43	43	46
C217	18	18	15	13
C224	68	-	68	68
C225	45	35	33	32
C235	47	37	33	33
C4292	15	12	12	12

E103	X	X	X	X
E204	X	X	X	X
E205	X	X	X	X
E4C7	X	X	X	X
E208	X	X	X	X
E209	X	X	X	X
E210	X	X	X	X
E211	X	X	X	X
E213	X			
E214	X			

PA ASM	REV LTR	PA ASM	REV LTR
PLI9042489505	D	PLI9042489503	A
PLI9042489502	C		
PLI9042489507	B		
PLI9042489508	B		
PLI9042489522	C	PLI9042489503	B
PLI9042489523	C		
PLI9042489524	C		
PLI9042489525	C		

40 WATT MODULE	REV LTR	FILTER MODULE	REV LTR	FREQUENCY
PLI9C321547	N	PLI9C327024G1		406-420 MHZ
PLI9C321547	M	PLI9C327024G2		450-470 MHZ
PLI9C321547	H	PLI9C327024G2		470-494 MHZ
PLI9C321547	H	PLI9C327024G2		494-512 MHZ
PLI9C321547	F	PLI9C327024G1		420-450 MHZ
PLI9C321547	N	PLI9C327024G7		406-420 MHZ
PLI9C321547	M	PLI9C327024G8		450-470 MHZ
PLI9C321547	H	PLI9C327024G8		470-494 MHZ
PLI9C321547	H	PLI9C327024G8		494-512 MHZ
PLI9C321547	F	PLI9C327024G7		420-450 MHZ

NOTES
1 MICROSTRIP PART OF PWB
2 ALL COMPONENTS MARKED WITH (*) ASTERISK SEE COMPONENT VALUE TABLE
3 INDICATES A-
INDICATES CHASSIS GROUND
4 CALLED FOR ON 19D417526
5 CALLED FOR ON 90424895
6
7 R216 USED ONLY IN 450-470 MHZ RANGE
8 C252 NOT USED IN PLI9C321547G9
9 ON PLI9C321547G9 DELETE L207 & ADD R213
10 ON PLI9C321547G9 DELETE L210 & ADD R214

* COMPONENT VALUE CHART

COMPONENT DESIGNATION	A 138-174MHZ	B 406-512MHZ
C1	7.0pF	4.7pF
C4	2.7pF	2.7pF
C5	10pF	
C6	10pF	

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH TRANSMITTER KEYED AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER WITH REFERENCE TO A- AND NOT CHASSIS GROUND! AN RF CHOKE (75-50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS NOTE READINGS AT Q202 COLLECTOR AND IN THE POWER CONTROL CIRCUIT WERE TAKEN WITH THE TRANSMITTER ADJUSTED FOR 40 WATT OUTPUT. THESE READINGS WILL VARY DEPENDING ON THE SETTING OF POWER ADJUST CONTROL R213

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

MODEL NO.	REV. LETTER
19C350774G1	
19C350774G2	

(198336186, Rev. 33)

(198233613, Rev. 1)

PARTS LIST

LBI30947

450-512 MHz, 40 WATT POWER AMPLIFIER
19D424880G03-G8, 30 (LOW/HIGHER DUTY)
19D424880G23-G29, 37 (COUNTERHIGHS DUTY)
19D424880G23-G29, 37 (COUNTERHIGHS DUTY - DUPLEX)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C297 and C298	19A116700P1	Ceramic, feed-thru: 0.01 µF ±100% -0%, 500 VDC; sim to Erie 327000X5R0103F.
C299*	19A134100P50	Ceramic disc: 2.2 pF ±0.1 pF, 100 VDC. Added to G6 by REV C, G23 by REV D.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
Q212	7878455P3	Terminal, lug.
Q4214	7878455P2	Terminal, lug.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J243	8481889P108	Connector, plug: includes 10 inch cable.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P203		Connector. Includes receptacle and adaptor. (Order separately).
	4029493P1	Receptacle, coaxial: sim to Amphenol 83-7?B.
	4029082P2	Adaptor.
P206 and P207	403683491	Contact, electrical; sim to AMP 42428-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q215	19A116733P1	Silicon, NPN; sim to Type 3N5302.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT201	19A129379G1	Thermistor: 40K ohms ±20%, color code white; sim to Carborundum Type M2806J-9.
		- - - - - - - - - - CABLES - - - - - - - - - -
*218	19A130532G1	Jumper.
*220	19B227087G1	Jumper.
*221	19B227086G1	Jumper.
*243	19A129312G6	Jumper cable: approx 10 inches long. (Includes J243 & P203).
*244	5491888P104	Cable, RF: approx 3-5/8 inches long.
		40 WATT MODULE 19C313763 406-470 MHz (LA) 19C313764G6 450-470 MHz (LJ) 19C313763G7 470-494 MHz (K) 19C313763G8 494-512 MHz (K) 19C313763G9 450-450 MHz (LA)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C201 and C202	19A116555P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C203	19A116193P1	Ceramic: 0.01 µF ±20%, 50 VDC; sim to Erie 8121 SPECIAL.
C204	19A116655P30	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C205	19A116656P330	Ceramic disc: 3 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
C206*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV A. Deleted in G8 by REV E. Added to G7, G8 by REV N. Deleted in G7 by REV P. In G6 thru G8 REV A: In G7 thru G8 REV N:
	19A134633G7 19A134633G8	Ceramic disc: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM15CS. Deleted in G7 by REV P.
C207	19A116655P60	Ceramic disc: 6 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
C208	19A116655P330	Ceramic disc: 33 pF ±5%, 500 VDC, temp coef 0 PPM.
C209	19A116656P330	Ceramic disc: 33 pF ±5%, 500 VDC, temp coef 0 PPM. Deleted in G6 by REV G, G8 by REV F, G7 & G9 by REV J.
C210	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C211	19A116193P1	Ceramic: 0.01 µF ±20%, 50 VDC; sim to Erie 8121 SPECIAL.
C213*	19A116656P620	Ceramic disc: 62 pF ±5%, 500 VDC, temp coef 0 PPM. Deleted by REV B.
C215	19A116655P30	Ceramic disc: 30 pF ±5%, 500 VDC, temp coef 0 PPM. Deleted by REV E. Added by REV K.
C216	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C217	19A116655P30	Ceramic disc: 30 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV E. Added in G6 by REV K. Deleted in G7, G8 by REV N.
C218	19A116655P18	Ceramic disc: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM15CS. Deleted in G6 by REV K. Added in G7, G8 by REV N.
C219	19A116656P470	Ceramic disc: 47 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV K. Added in G6 by REV N.
C220	19A116655P50	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C221	19B209723P4	Tantalum: 6.8 µF ±20%, 35 VDC.
C222	19A134666P1	Silver mica: 47 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV K.
C223	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C224	19A116952P41	Metallized teflon: 41 pF ±2%, 250 VDC.
C225	19A116952P35	Metallized teflon: 35 pF ±2%, 250 VDC.
C226	19A116952P35	Metallized teflon: 35 pF ±2%, 250 VDC.
C227	19A116952P33	Metallized teflon: 33 pF ±2%, 250 VDC.
C228	19A116952P47	Metallized teflon: 47 pF ±2%, 250 VDC.
C229	19A116952P39	Metallized teflon: 39 pF ±2%, 250 VDC.
C230	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
C231	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C232	19B209723P4	Tantalum: 6.8 µF ±20%, 35 VDC.
C233	19A134100P20	Ceramic disc: 2.2 pF ±0.1 pF, 100 VDC. Deleted by REV B.
C234	19A134100P20	Ceramic disc: 2.2 pF ±0.1 pF, 100 VDC. Deleted by REV B.
C235	19A116655P18	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM15CS. Deleted in G6 by REV K. Added in G6 by REV N. Deleted in G7, G8 by REV P.
C236	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDC; sim to RMC Type JF Discap. Added to G6 by REV J. Added to G6 by REV N.
C237	19A116656P470	Ceramic disc: 47 pF ±5%, 500 VDC, temp coef 0 PPM. Added to G6 by REV K.
C238	19A116655P30	Ceramic disc: 30 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV K. Added in G6 by REV N.
C239	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted from G6 by REV H.
C240	19A134666P1	Silver mica: 47 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV K.
C241	19A134100P15	Tantalum: 6.8 µF ±20%, 35 VDC.
C242	19A116655P80	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C243	19A134102P15	Tantalum: 6.8 µF ±20%, 35 VDC.
C244 thru C245	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C246 thru C250	19A116655P50	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C251	19A116193P1	Ceramic: 0.01 µF ±20%, 50 VDC; sim to Erie 8121 SPECIAL.
C252	19A116656P5J0	Ceramic disc: 5 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV E-L:
	19A116656P8J0	Ceramic disc: 9 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV B-G:
	19A116656P6J0	Ceramic disc: 6 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV A & earlier: In G8 of REV K & earlier:
	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
C253	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C255 and C256	19A116656P18	Ceramic disc: 680 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C257	19A116655P30	Ceramic disc: 5 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV M: In REV K-L:
	19A116656P7J0	Ceramic disc: 7 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV L & earlier:
	19A116655P30	Ceramic disc: 5 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
C257	19A134100P50	Ceramic disc: 2.2 pF ±0.1 pF, 100 VDC. Deleted by REV B.
C257	19A134100P19	Ceramic disc: 1 pF ±0.1 pF, 100 VDC. Deleted by REV B.
C257	19A134100P19	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C260	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap.
C262	19A116114P2064	Ceramic: 27 pF ±5%, 100 VDC, temp coef -80 PPM. Added to G8 by REV F. Deleted by REV G.
C2?81 and C264	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDC; sim to RMC Type JF Discap. Added to G6 by REV E. Added to G6 by REV H. Added to G7 & G8 by REV G. Added to G8 by REV C.
C4201	19A116053P1	Silicon, hot carrier: Fwd. drop .350 volts max.
CR202 thru CR205	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E201 and E202	19A134363P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.
G211	19A134363P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J201	19A130824G1	Connector, receptacle: coaxial, jack type, sim to Cinch 14811x13.
J205	19B219374G1	Connector. 9 contacts.
T201 thru T205	19A116?48G1	Coil.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L207	19A129773G1	Coil.
L209	19A129774P1	Coil.
L208	19A129773G1	Coil.
L205	19A116656P6J0	Ceramic disc: 6 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
L206	19A700000P130	Coil, RF. 5.6 µH ±10%, 0.13 ohms DC res max.
L207*	19A700000P50	Coil, RF. 5.6 µH ±10%, 0.280 ohms DC res max. Deleted in G5 by REV E, G9 by REV K.
L208L	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDC, temp coef 0 PPM.
L208L	19B218437P8	Coil.
L208L	19A130650P1	Coil.
L208M	19A130650P1	Coil.
L208N	19A116656P2J0	Ceramic disc: 2 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. In REV J-K:
L209	19A129773G1	Coil.
L210L*	19A700000P25	Coil, RF. 15.0 µH ±10%, 1.20 ohms DC res max. Deleted by REV N.
L210L	19A700000P50	Coil, RF. 5.6 µH ±10%, 0.280 ohms DC res max.
L210M	19A700000P50	Coil, RF. 5.6 µH ±10%, 0.280 ohms DC res max. In REV B-H:
	19A116656P5J0	Ceramic disc: 5 pF ±0.5 pF, 500 VDC, temp coef 0 PPM. Added by REV B.
L210N	19A700000P50	Coil, RF: 5.6 µH ±10%, 0.280 ohms DC res max.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q201	19A134233P1	Silicon, NPN.
Q202	19A134616P2	Silicon, NPN; sim to Type 2N5045.
Q203A*	19A134617LP3	Silicon, NPN. In REV J-K:
	19A134617LP4	Silicon, NPN. In REV H & earlier:
	19A134617LP2	Silicon, NPN, UHF Amplifier: 35 w, 13.5 volts.
Q203L	19A134239P1	Silicon, NPN.
Q203M	19A134239P1	Silicon, NPN.
Q203N	19A134239P1	Silicon, NPN.
Q204	19A134343P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R201	19A700100P63	Composition: 1K ohms ±5%, 1/4 w.
R202	3B152P306J	Composition: 300K ohms ±5%, 1/4 w
R203*	19A700113P7	Composition: 4.7 ohms ±5%, 1/2 w. Deleted by REV C. Added by REV D.
R204*	19A700001SP55	Composition: 27 ohms ±5%, 1/2 w. In REV B & earlier:
	3B??P??GJ	Composition: 22 ohms ±5%, 1/2 w.
R205	19A700100P33	Composition: 33 ohms ±5%, 1/4 w.
R206	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R207	19A700100P33	Composition: 68 ohms ±5%, 1/4 w.
R208	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R209	19A700113P57	Composition: 680 ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R210, R211, R212	19C320211P1	Shunt resistor.
R213	19A116559P102	Variable, cermet. 5K ohms ±20%, .5 w, sim to CTS Series 360.
R214	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R215	19A700100P25	Composition: 27 ohms ±5%, 1/4 w.
R216*	19A700113P15	Composition: 10 ohms ±5%, 1/2 w. Added to G4 by REV F. Deleted by REV L.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T201	19A116?48G1	Coil.
		- - - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - - -
U201	19B218?62G1	Power Control.
VR201	4033683?P1	Zener: 5.6 volts ±5% - sim
VR202	4033683?P5	Zener: 5.6 volts ±4% - sim
		- - - - - - - - - - CABLES - - - - - - - - - -
*201 thru *205		(Part of printed board 19D423005P1).
*206	19A129571P2	Strap.
*209	19B226?33G1	Jumper.
*210	19B226?34G1	Jumper.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z201*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Deleted in G6 by REV K. Added to G6 by REV N. Deleted in G7, G8 by REV P. Added to G8 by REV E.
Z203L*	19A134666P3	Silver mica: 27 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K. Added to G8 by REV D.
Z203L*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z203M*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z204L*	19A134666P3	Silver mica: 27 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV L. Added to G8 by REV D.
Z204L*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z204M*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z205L*	19A134666P3	Silver mica: 27 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K. Added to G9 by REV D.
Z205M*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z206L*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K. Added to G9 by REV D.
Z206M*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.
Z207L*	19A134666P3	Silver mica: 27 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K. Added to G9 by REV D.
Z207M*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDC; sim to Electro Motive Type DM19AC. Added to G6 by REV K.

(Cont'd on Page 10)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

406 - 512 MHz
UHF ANTENNA MATCHING UNIT
19C330778G2 LOW POWER
19C330778G3 HIGH POWER
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1B	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-A050-W5R-471M.
C2	19A700008P2	Variable, air: 2.28 to 14.13 pf, 250 v; sim to EF Johnson Type T 187-0109-005.
C4B	19A700008P1	Variable, air: 2.04 to 9.9 pf, 250 v; sim to EF Johnson Type T 187-0106-005.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A700047P3	Diode, silicon: 0.410 volt max.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1B	19A143342P1	Coil.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.

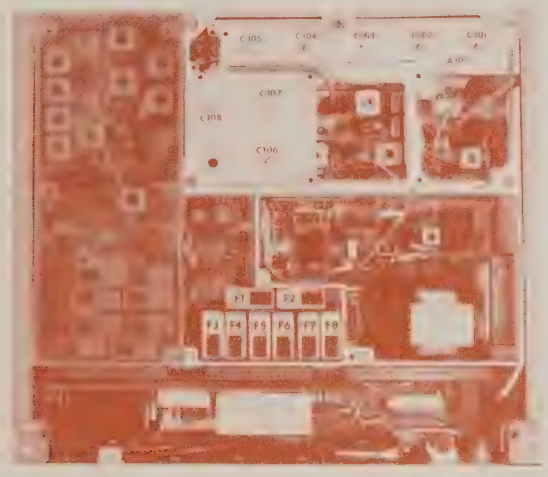
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

406-512 MHz RECEIVER

Maintenance Manual LBI30025C
(DF1104, THIS SHEET ONLY)
(Supersedes LBI4627)



406-512 MHz OSC/MULT 19D423266G1-8 IF-FLTR
19C320523G1 & IFAS 19D417707G-1 RF ASM 19D417075G9-12

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OSCILLATOR/MULTIPLIER BOARD LBI30029 (DF1106)

IF AUDIO AND SQUELCH BOARD LBI4986 (DF1105)

GENERAL ELECTRIC

SYMBOL	GE PART NO.	DESCRIPTION
A208A1*	19A134668P3	Silver mica: 27 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G5 by REV D.
A208A2*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G6 by REV E.
A208A3*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G7 by REV H.
A208A4*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G8 by REV H.
A208A5*	19A134668P3	Silver mica: 27 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G9 by REV L. Added to G8 by REV D.
A208A6*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G8 by REV E.
A208A7*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G7 by REV E.
A208A8*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G6 by REV E.
A208A9*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G5 by REV L. Added to G6 by REV E. Added to G7, G8 by REV H. Added to G9 by REV D.
A208A10*	19A134668P3	Silver mica: 27 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G5 by REV L. Added to G8 by REV D.
A211A1*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G6 by REV E.
A211A2*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G7 by REV H.
A211A3*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G8 by REV H.
A211A4*	19A134668P1	Silver mica: 18 pf ±5%, 500 VDCW, sim to Electro Motive Type DM15AC8. Added to G9 by REV L. Added to G6 by REV E. Added to G7, G8 by REV H. Added to G9 by REV D.
A211A5 AND A211A6*	19A143081G1	NETWORK ASSEMBLY (Added to G5 by REV M, G8 by REV E)
L1	19A700024P1	Coil, RF. 100 uH ±10%, 0.08 ohms DC res max.
L2	19A129773G1	Coil.
R1	19A700010P15	Composition: 10 ohms ±5%, 1/4 w.
C429A1	19A700014P4	Metallized teflon: 10 pf ±5%, 250 VDCW.
C429A2	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW.
C429A3	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW.
C429A4	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDCW.
C429A5	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDCW.
C429A6	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW.
C429A7	19A700015P37	Metallized teflon: 230 pf ±5%, 250 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
L429A1	19B226709G2	Jumper. (Includes L429ALL).
L429A2	19B226709G1	Jumper. (Includes L429ALL).
L429ALL		(Part of L429ALL).
L429A3	19B226709G3	(Part of L429ALL).
J200 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14811613.
J204 and J207	19A134263P2	Contact, electrical: sim to Selectro 228-1071.
J208	403351P4	Contact, electrical: sim to Bead Chain LB3-3.
K201	19A700021P1	Hermetic sealed: 180 to 341 ohms coil res, 8-16.3 VDC; sim to GE 3HAV1760A2, CP Clare HFA-1201S58, or Potter/Brumfield MCW6180.
W280 thru W293		(Part of printed board 19D423812P1).
W294	19A130907G3	Cable: approx .7 of an inch.
C428G8	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW.
C429A8	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDCW.
C428G9	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW.
C428A9	19A700015P37	Metallized teflon: 220 pf ±5%, 250 VDCW.
L428A1 and L428A2	19B226709G1	Jumper.
J202 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14811613.
J206 and J207	403351P4	(Part of K201).
J208	403351P4	Contact, electrical: sim to Bead Chain LB3-3.
K201	19A116722P1	Hermetic sealed: 125 ohms ±20%, 1 form C contact, 9.6 to 15.8 VDC (over the temp range indicated). (Includes J206 & J207).
W280 thru W293		(Part of printed board 19D423111P1).

SYMBOL	GE PART NO.	DESCRIPTION
C429LL	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDC.
C429L1A	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDC.
C429ALL	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDC.
C429A2B	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDC.
C429A3	19A700015P37	Metallized teflon: 230 pf ±5%, 250 VDC.
L429LLL	19B226709G2	Jumper. (Includes L429ALL).
L429L1B	19B226709G1	Jumper. (Includes L429ALL).
L429LLL		(Part of L429ALL).
L429A2B		(Part of L429ALL).
J202 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14811613.
J4701 thru J4706	19A116J24P2	Contact, electrical; sim to AMP 88168-7 (LOOSE PIECE).
W280 thru W282		(Part of printed board 19D420879P2).
C1B	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 811-4G20-471K.
C2	19A700008P2	Variable, air: 2.28-14.13 pf, 250 VDCW, temp coef 30 ±15 Parts/M°C.
C4B	19A700008P1	Variable, air: 2.04-8.9 pf, 250 VDCW, temp coef 20 ±10 Parts/M°C.
CR1	19A700047P3	Diode, silicon: 0.410 volt max.
L1B	19A143342P1	Coil.
R1	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
W241	5491689P104	Cable, RF: approx 3-5/8 inches long.
	5492178P2	Washer, spring tension: sim to wallace Barnes 375-SS. (Used with Q202).
	19A130645P1	Spacer. (Used with Q202).
	#20?P15C6	Nut, hex: No. 8-32. (Used with Q202).
	N44P6010C6	Machine screw: No. 6-40 x 5/8. (Used with Q202).
	N40P13010C6	Machine screw, Phillips head: No. 4-32 x 1. (Secures Filter Assembly).
	19B201074P306	Tap screw, Phillips POLIDRIV®: No. 4-32 x 1/8. (Secures G4124).
	19C321481P1	Insulator. (Located under 40 watt module).
	4036555P1	Insulator, washer; nylon. (Used with Q201).
	#2109P6C	Hex nut: No. 6-40. (Secures Q215).
	19A115223P3	Insulator, Bushing: (Secures Q215).
	#40P6007C6	Machine screw: No. 6-40 x 7/16. (Secures Q215).

SYMBOL	GE PART NO.	DESCRIPTION
	19B201074P308	Tap screw, Phillips POLIDRIV®: No. 6-32 x 1/2. (Secures Filter Board).
	7150184P115	Spacer. (Located at junction of W231).
	19821940G1	Filter web.
	19B201074P312	Tap screw, Phillips POLIDRIV®: No. 6-32 x 3/4. (Secures W221 to spacer).
	19B226212G1	Heat sink. (Center sections- Quantity 3).
	19B226212G3	Heat sink. (Caution nameplate end- Quantity 1).
	19D417513G1	Cover, Heat Sink Assembly.
	7139E96P3	Hex nut: No. 1/4-28. (Secures C297).
	19B201074P204	Tap screw, Phillips POLIDRIV®: No. 4-40 x 1/4. (Secures W261).

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - PA Assembly 19D424893G5-G8, G22-G25
To incorporate new low-pass filter. Deleted 19C321414. Added 19C327024.

REV. A - 40 Watt Module 19C321347G5-G8
To improve power output at cold temperatures. Added CR204 & CR205.

REV. B - 40 Watt Module 19C321347G5-G8
To improve operation.
In 19C321347G5: deleted C313 and Changed C358LB.
In 19C321347G6: deleted C230L, C237L and added C252LB.
In 19C321347G7: deleted C237B and added C230D.
In 19C321347G8: deleted C233E, C237B and added C252HB.

REV. C - 40 Watt Module 19C321347G5-G8
To improve operation. Deleted C209 and R203. Changed R204.

REV. D - 40 Watt Module 19C321347G5
To improve station operation. Added C205 and R203.

REV. L - 40 Watt Module 19C321347G5
To improve station operation. Added C213.

REV. D - 40 Watt Module 19C321347G6-G8
To improve operation. Changed C206.

REV. F - 40 Watt Module 19C321347G5
To improve operation. Changed C206.

REV. E - 40 Watt Module 19C321347G7, G8
To improve RF output & efficiency. Changed C237 (Group 8) and C238 (Groups 7-8).

REV. G - 40 Watt Module 19C321347G5
REV. L - 40 Watt Module 19C321347G8
REV. I - 40 Watt Module 19C321347G7, G8
To decrease spurious outputs. Changed C207L, M and C209. Deleted C206L, M, N. Added R203 to Groups 6, 7 and 8.

REV. H - 40 Watt Module 19C321347G3
To increase output at 406 MHz. Changed C252LLB. Deleted C239. Added C230LLB.

REV. J - To improve stability. Changed Q203LL.

REV. F - 40 Watt Module 19C321347G6
To improve stability. Added R216 and C262.

REV. G - To improve operation. Deleted C262.

REV. A - 40 Watt Module 19C321347G9
To improve operation. Added C240LL.

REV. H - To improve stability. Changed Q203LL.

REV. K - 40 Watt Module 19C321347G5
REV. H - 40 Watt Module 19C321347G6
REV. C - 40 Watt Module 19C321347G7
REV. G - 40 Watt Module 19C321347G8
REV. L - 40 Watt Module 19C321347G9
To improve operation of power regulator circuit when used as driver for 100 Watt PA. Added C263 and C264.

REV. J - 40 Watt Module 19C321347G6
To increase output power at low end of 450-470 MHz range. Changed C252.

REV. L - 40 Watt Module 19C321347G9
REV. A - 40 Watt Module 19C321347G6
REV. H - 40 Watt Module 19C321347G7
REV. H - 40 Watt Module 19C321347G8
REV. H - 40 Watt Module 19C321347G9
To incorporate new nomenclature for frequency selection networks.

REV. A - PA Assembly 19D424893G36, G37
REV. B - PA Assembly 19D421893, G5-G8, G22-G25
To improve operation of power control transistor. Changed Q215.

REV. C - PA Assembly 19D424893G6
REV. D - PA Assembly 19D421893G23
To improve power output. Added C299.

REV. C - PA Assembly 19D424893G22-G25
REV. D - PA Assembly 19D421893G37
To improve operation in duplex applications. Changed low pass filters. (Added Antenna Matching Unit).

REV. N - 40-Watt Module 19C321347G5
REV. I - 40-Watt Module 19C321347G9
To improve power output across the board. Deleted C213LL, L207 and L210LL. Added R213 and E214. Changed C237LL, C252LLB (Group 5 only), and Q200LLB.

REV. N - 40-Watt Module 19C321347G3
REV. F - 40 Watt Module 19C321347G9
To improve power output. Changed C230LL, C235LL, C236LL and C237LL. Added C252LL.

REV. L - 40-Watt Module 19C321347G6
To increase power output. Changed C252LB and C237. Deleted R216 and C230.

REV. M - 40-Watt Module 19C321347G6
To improve power output over the 450-470 MHz range. Changed C219L and C252L.

PARTS LIST

406 - 512 MHz
UHF ANTENNA MATCHING UNIT
19C327778G2 LOW BANDS
19C327778G3 HIGH BANDS
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1B	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 811-4G20-471K.
C2	19A700008P2	Variable, air: 2.28 to 14.13 pf, 250 v; sim to EF Johnson Type T 187-0100-002.
C4B	19A700008P1	Variable, air: 2.04 to 8.9 pf, 250 v, sim to EF Johnson Type T 187-0100-005.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1	19A700047P3	Diode, silicon: 0.410 volt max.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1B	19A143342P1	Coil.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.

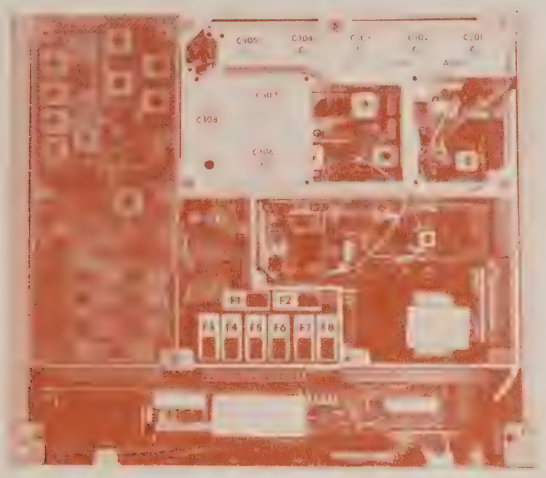
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

406-512 MHz RECEIVER

Maintenance Manual LBI30025C
(DF1104, THIS SHEET ONLY)
(Supersedes LBI4627)



406-512 MHz OSC/MULT 19D423266G1-8 IF-FLTR
19C320523G1 & IFAS 19D417707G-1 RF ASM 19D417075G9-12

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IF AUDIO AND SQUELCH BOARD	LBI4986 (DF1105)

GENERAL ELECTRIC

SPECIFICATIONS*

Audio Output (to 8-ohm Speaker)	12 Watts at less than 3% distortion	
Sensitivity	With Pre-Ampl	Without Pre-Ampl
12-dB SINAD (EIA Method)	0.20 μV	0.35 μV
20-dB Quieting Method	0.25 μV	0.50 μV
Selectivity		
EIA Two-Signal Method	-90 dB	-90 dB
20-dB Quieting Method		-100 dB
Spurious Response	-90 dB	-100 dB
Intermodulation (EIA)	-75 dB	-80 dB
Squelch Sensitivity		
Critical Squelch	0.2 μV	0.1 μV
Maximum Squelch	Greater than 20 dB quieting (less than 1.5 μV)	
Frequency Stability		
5C-ICOM with EC-ICOM	±0.0005% (-40°C to +70°C)	
5C-ICOM or EC-ICOM	±0.0002% (0°C to +55°C)	
2C-ICOMS	±0.0002% (-40°C to +70°C)	
Modulation Acceptance	±7 kHz (narrow-band)	

Maximum Frequency Separation	Full Specifications	3 dB Degradation
406 - 470 MHz	1.60 MHz	2.0 MHz
470 - 494 MHz	1.50 MHz	2.0 MHz
494 - 512 MHz	1.50 MHz	2.0 MHz

Frequency Response	Within ±1 and -8 dB of a standard 6 dB per octave de-emphasis curve from 300 to 3000 Hz (1000-Hz reference)
RF Input Impedance	50 ohms

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

WARNING

Although the highest DC voltage in the MASTR II receiver is +12 Volts DC, high current may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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LBI30113F
(DF1104)
(DF1119, IMTS)

DESCRIPTION AND MAINTENANCE
MASTR® II 406—512 MHz RECEIVER

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DESCRIPTION

MASTR® II, 406 to 512 megahertz receivers are single conversion superheterdyne FM receivers designed for one- through eight-frequency operation. The solid state receiver utilizes integrated circuits (ICs), monolithic crystal filters and discrete components with each of the crystal filters located between gain stages to provide 100 dB selectivity and maximum protection from de-sensitization and intermodulation.

The receiver consists of the following modules:

- RF Assembly (Includes Mixer)
- IF-Filter
- Oscillator/Multiplier (Osc/Mult)
- IF/Audio and Squelch (IFAS)
- Optional Ultra-High Sensitivity (UHS) Pre-Amplifier

Audio, supply voltages and control functions are connected to the system board through P903 on the Osc/Mult board, and P904 on the IFAS board. The regulated +10 Volts is used for all receiver stages except the audio PA stage which operates from the A+ system supply.

Centralized metering jack J601 on the IFAS board is provided for use with GE test Set 4EX3A11 or Test Kit 4EX8K12. The test set meters the oscillator, multiplier, IF Detector and IF amplifier stages. Speaker high and low are metered on the system board metering jack.

A block diagram of the complete receiver is shown in Figure 1.

Refer to the appropriate Maintenance Manual for complete details on each receiver module listed in the Table of Contents.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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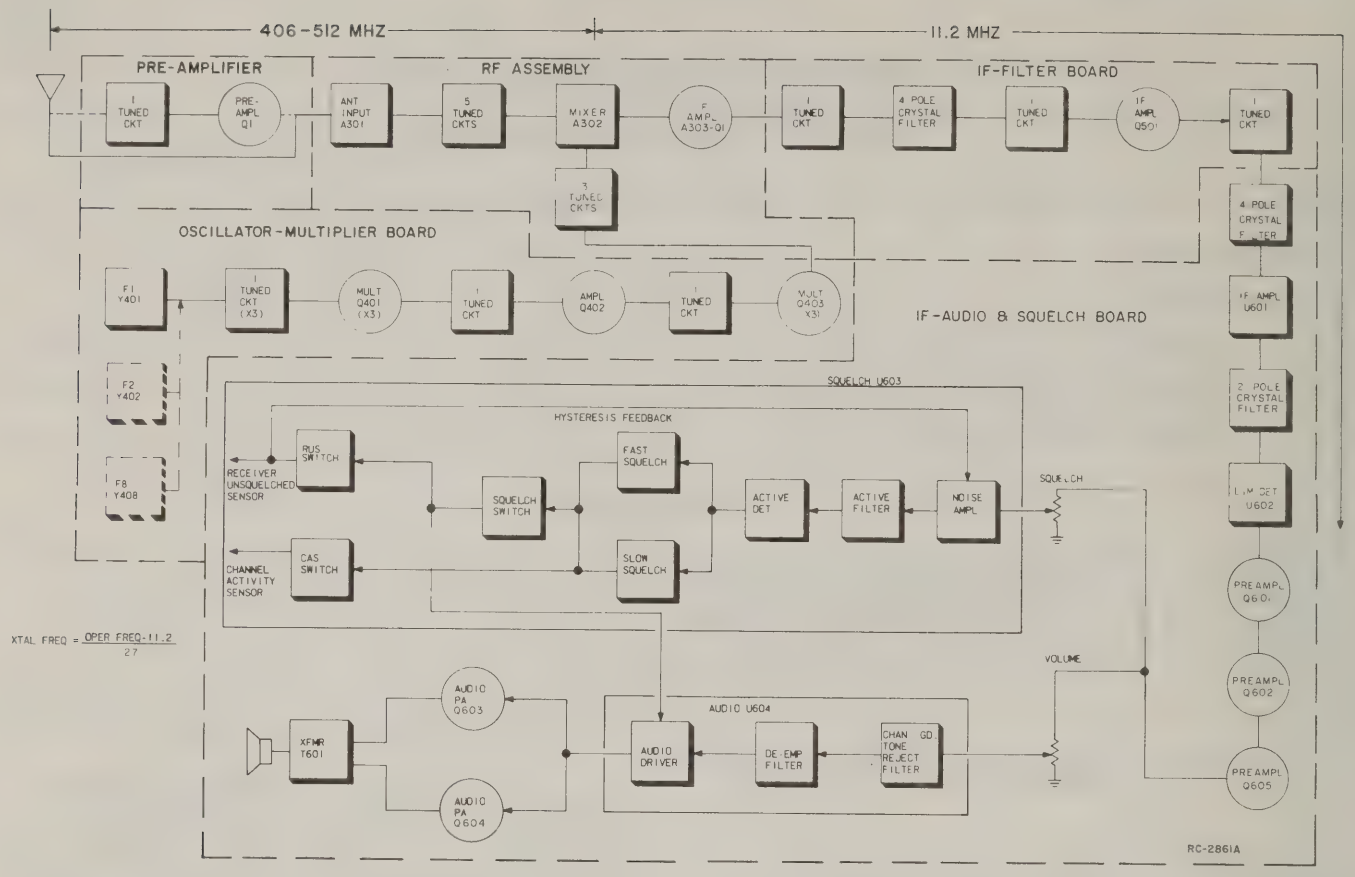

Figure 1 - Receiver Block Diagram

MAINTENANCE

DISASSEMBLY

To service the Receiver from the top (see Mechanical Parts Breakdown):

1. Pull the locking handle down, then pry up the top cover at the front notch and lift off the cover.

To service the Receiver from the bottom:

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Remove the top cover, then loosen the two bottom cover retaining screws and remove the bottom cover (see Figure 2).
3. To gain access to the bottom of the Osc/Mult and IFAS board, remove the six screws (A) holding the receiver bottom cover (see Figure 3).

To remove the Osc/Mult board from the radio:

1. Remove the six screws (A) holding the receiver bottom cover.
2. Remove the eight screws (E) holding the IF-Filter bottom cover.
3. Remove the four screws (B) holding the board.
4. Press straight down on the plug-in Osc/Mult board from the top to avoid bending the pins when unplugging the board from the system board jack.

To remove the IFAS board from the radio:

1. Remove the six screws (A) holding the bottom cover, and the one screw (C) holding the board.
2. Remove the two screws (D) holding the audio PA heatsink to the right side rail.
3. Press straight down on the plug-in IFAS board from the top to avoid bending the pins when unplugging the board from the system board jack.

To remove the IF-Filter board from the radio:

1. Remove the eight screws (E) holding the IF-Filter bottom cover.
2. Remove the six screws (F) holding the IF-Filter top cover.
3. Remove the two screws (G) and the Connector (H), and carefully push down

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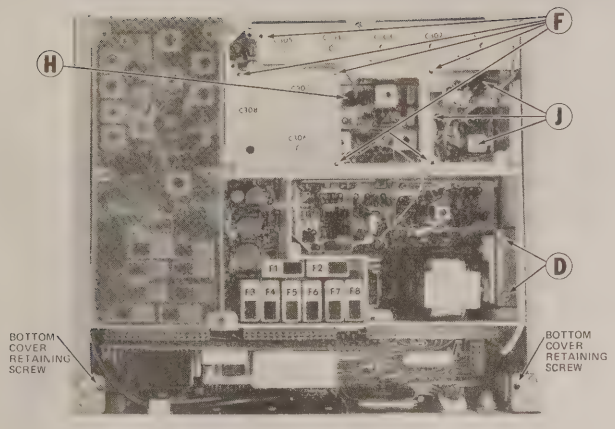


Figure 2 Disassembly Procedure (Top View)

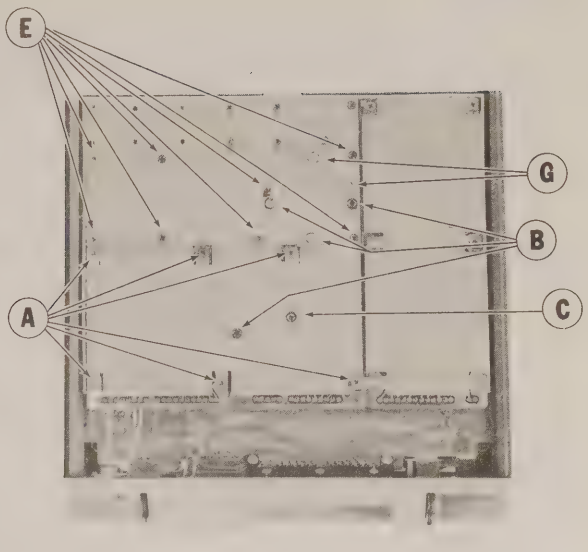
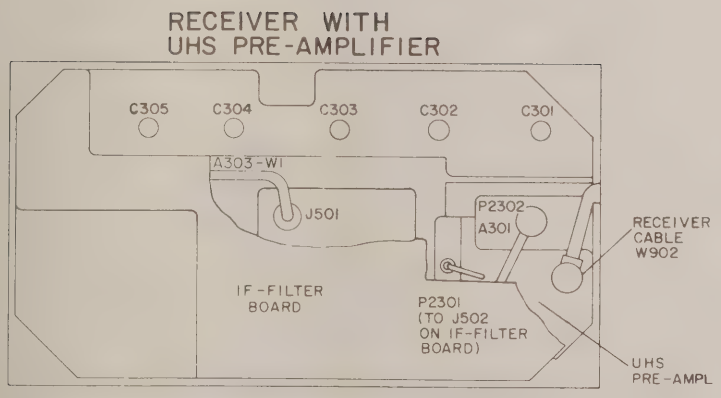


Figure 3 Disassembly Procedure (Bottom View)

on the top of the board to avoid damaging the feedthrough capacitors.

To remove the optional UHS pre-amplifier board:

1. Remove the eight screws (E) holding the IF-Filter bottom cover, and the six screws (F) holding the IF-Filter top cover.
2. Disconnect the two connectors and 10-Volt lead (J) .
3. Remove the three screws on the bottom side of the board, and lift out the board.



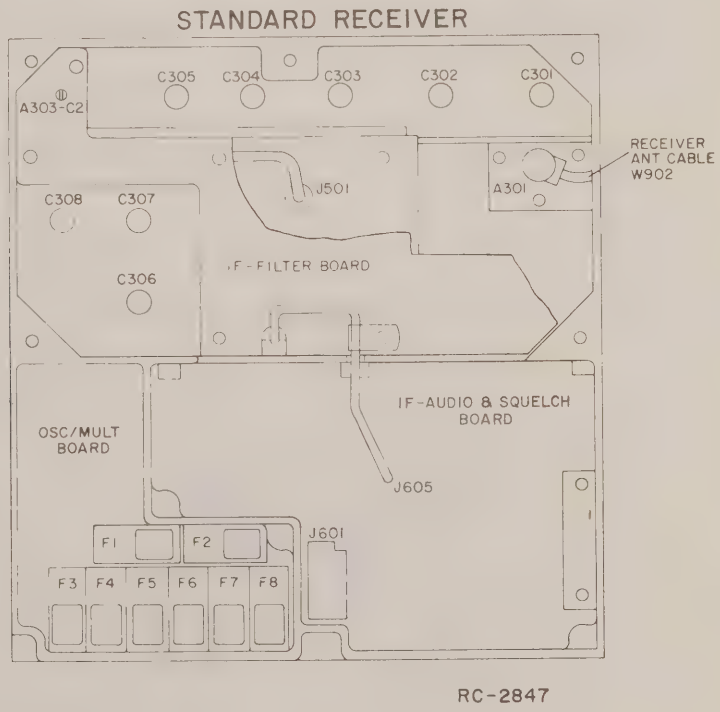


Figure 4 - Reciever Module Location

MODIFICATION INSTRUCTIONS FOR UHF HIGH SIDE INJECTION APPLYING 19A130045G5 KIT.
THIS MODIFICATION IS NOT REQUIRED FOR RECEIVERS OPERATING IN THE FOLLOWING RANGES.
450 TO 458.8 MHz
470 TO 482.8 MHz
494 TO 500.8 MHz

1. FOR RECEIVERS OPERATING BETWEEN 458.8 TO 470 MHz (OSC/MULT BD'S 19D423266G2 & G6):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2315 (13pf, -N80). REPLACE C412 WITH C2316 (5pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2317 (8pf, N80). REPLACE C412 WITH C2316 (5pf, NPO)

2. FOR RECEIVERS OPERATING BETWEEN 482.8 TO 494 MHz (OSC/MULT BD'S 19D423266G3 & G7):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2318 (10pf, N80). REPLACE C412 WITH C2319 (4pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2320 (6pf, N80). REPLACE C412 WITH C2319 (4pf, NPO)

3. FOR RECEIVERS OPERATING BETWEEN 500.8 TO 512.0 MHz (OSC/MULT BD'S 19D423266G4 & G8):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2317 (8pf, N80). REPLACE C412 WITH C2321 (3pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2316 (5pf, N80). REPLACE C412 WITH C2321 (3pf, NPO).

4. SOLDER ALL ELECTRICAL CONNECTIONS. DISCARD CAPACITORS NOT USED.

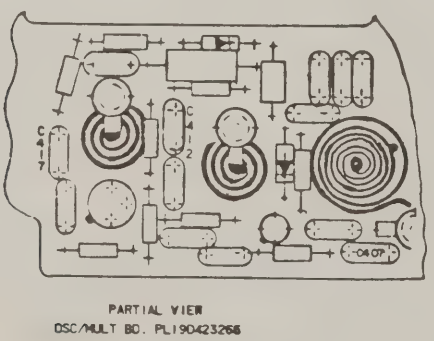
5. IN APPLICATION OF THIS KIT THE CRYSTAL OSCILLATOR FREQUENCY MUST BE CHANGED PER THE FOLLOWING FORMULA:

$$\frac{FX = Fo + 11.2}{27}$$

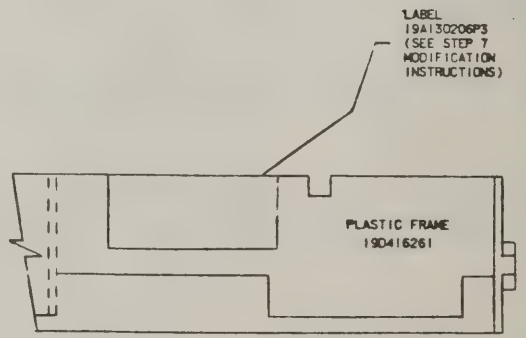
6. MARK ALL OSC/MULT BD'S (19D423266) WITH A BLUE COLOR DOT IN THE AREA OF THE PL DRAWING NO. PER 19A115740P1.

7. APPLY LABEL (19A130206P3) TO SIDE OF PLASTIC FRAME.

8. TEST AND ALIGN PER NORMAL PROCEDURE.



PARTIAL VIEW
OSC/MULT BD. PL19D423266



MODIFICATION INSTRUCTIONS

(19C320883, Sh. 6, Rev. 3)

HIGH SIDE INJECTION

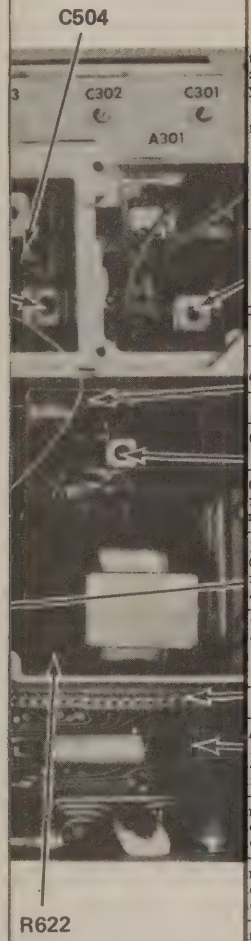
ith a one-inch piece of insulated wire

to system board metering jack J905. Set the

of 406-470 MHz, 0.900 MHz for frequency range
channel nearest center frequency.

than 1.60 MHz for frequency range of 406-470 MHz,
z, align the receiver using a center frequency
y, with 3 dB degradation in standard receiver

from J905-3 to J905-9.



PROCEDURE
signal applied, adjust L603 for a meter reading oximately 0.38 Volt.
06 for maximum meter reading.
C411 and C416 to a position similar to C406. reset C306, C307 and C308 fully counterclockwise m capacity).
11 and C416 for maximum meter reading. Next, C406, C411 and C416 for maximum meter reading. refully tune C306 for a change in meter read- ak or dip).
ly tune C307 and C306 for maximum meter reading. the procedure. Next, carefully tune C308 for meter reading, and retune C306 for maximum meter . Do NOT readjust C307 and C308.
A303-C2 to mid position. Apply an on-frequency in the hole adjacent to C304, keeping the signal aturation. Then tune C305, C304 and then A303-C2 imum meter reading.
n on-frequency signal in the hole adjacent to eeping the signal below saturation. Then tune d C303 for maximum meter reading.
n on-frequency signal in the hole adjacent to eeping the signal below saturation. Then tune d then C302 for maximum meter reading.
n on-frequency signal to the antenna jack, keep- signal below saturation. Then tune C301 through d A303-C2 for maximum meter reading. In receiv- h the UHS preamplifier, also tune L2301 for meter reading.
n on-frequency signal to the antenna jack and y tune C301 through C305, A303-C2 (and L2301 if) for best quieting sensitivity. C306, C307 & so may be tuned slightly (not to exceed 1/4 turn).
the Test set metering plug from J601. Apply a rovolt signal with 1 kHz modulation and 3 kHz on to the antenna jack. Tune L603 for maximum at 1.0 kHz and adjust R608 for 1 Volt RMS mea- ith a VTVM at P904-11 (VOL/SQ HI) and P904-17 (A-).
rther adjustment. If adjustment is necessary,
s) for helpful suggestion on
scope, signal generator, and probe as shown in 5. Set signal generator level for 3 to 5 μV and e with 20 Hz at 10 kHz deviation. With probe be- 904-4 (or J601-1) and A-, tune L507, L503, L504 4 for double trace as shown on scope pattern.
o see that modulation acceptance bandwidth is than ±7 kHz.
adjust control R622 (if present) is preset at the . If further adjustment is required, adjust R622 IFAS board for best squelch operation. NOTE: squelch decreases with increasing resistance.

Receiver
Ant. Jack
IF Outpu
P904-4
loscope
-Trace Sweep

MODIFICATION INSTRUCTIONS FOR UHF HIGH SIDE INJECTION APPLYING 19A130045G5 KIT.
THIS MODIFICATION IS NOT REQUIRED FOR RECEIVERS OPERATING IN THE FOLLOWING RANGES.
450 TO 458.8 MHz
470 TO 482.8 MHz
494 TO 500.8 MHz

1. FOR RECEIVERS OPERATING BETWEEN 458.8 TO 470 MHz (OSC/MULT BD'S 19D423266G2 & G6):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2315 (13pf, -N80). REPLACE C412 WITH C2316 (5pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2317 (8pf, N80). REPLACE C412 WITH C2316 (5pf, NPO)

2. FOR RECEIVERS OPERATING BETWEEN 482.8 TO 494 MHz (OSC/MULT BD'S 19D423266G3 & G7):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2318 (10pf, N80). REPLACE C412 WITH C2319 (4pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2320 (6pf, N80). REPLACE C412 WITH C2319 (4pf, NPO)

3. FOR RECEIVERS OPERATING BETWEEN 500.8 TO 512.0 MHz (OSC/MULT BD'S 19D423266G4 & G8):
   A. IF THE RECEIVER HAS LESS THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2317 (8pf, N80). REPLACE C412 WITH C2321 (3pf, NPO).

   B. IF THE RECEIVER HAS MORE THAN 8 ICOMS, REMOVE C407, C412, C417.
      REPLACE C407 WITH C2316 (5pf, N80). REPLACE C412 WITH C2321 (3pf, NPO).

4. SOLDER ALL ELECTRICAL CONNECTIONS. DISCARD CAPACITORS NOT USED.

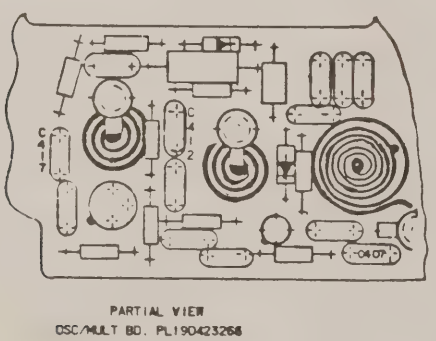
5. IN APPLICATION OF THIS KIT THE CRYSTAL OSCILLATOR FREQUENCY MUST BE CHANGED PER THE FOLLOWING FORMULA:

$$FX = \frac{Fo + 11.2}{27}$$

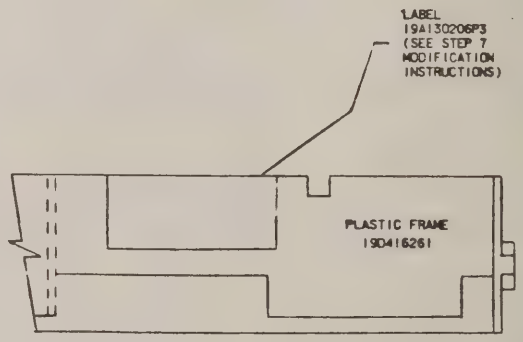
6. MARK ALL OSC/MULT BD'S (19D423266) WITH A BLUE COLOR DOT IN THE AREA OF THE PL DRAWING NO. PER 19A115740P1.

7. APPLY LABEL (19A130206P3) TO SIDE OF PLASTIC FRAME.

8. TEST AND ALIGN PER NORMAL PROCEDURE.



PARTIAL VIEW
OSC/MULT BD. PL19D423266



MODIFICATION INSTRUCTIONS

(19C320883, Sh. 6, Rev. 3)

HIGH SIDE INJECTION

FRONT END ALIGNMENT

EQUIPMENT

1. GE Test Set Models 4EX3A11, 4EX8E17, or 20,000 ohms-per Volt multimeter with a 1-Volt scale.
2. A 406-512 MHz signal source.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect black plug from Test Set to Receiver Centralized Metering Jack J601, and red plug to system board metering jack J905. Set meter sensitivity switch to the TEST 1 position (or 1-Volt position on 4EX8E12).
2. For multi-frequency receivers with a frequency spacing exceeding the above but no greater than 1.60 MHz for frequency range of 406-470 MHz, 0.900 MHz for frequency range of 470-494 MHz, or 1.50 MHz for frequency range of 494-512 MHz, align the receiver on the channel nearest center frequency.

   For multi-frequency receivers with a frequency spacing exceeding the above but no greater than 1.60 MHz for frequency range of 406-470 MHz, 0.900 MHz for frequency range of 470-494 MHz, or 1.50 MHz for frequency range of 494-512 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to 2.00 MHz, 2.30 MHz and 2.00 MHz respectively, with 3 dB degradation in standard receiver specifications.
3. With Test Set in Position J, check for regulated +10 Volts. If using multimeter, measure between J905-3 (+) and J905-9 (-).
4. If using multimeter, connect the negative lead to J601-9 (A-).
5. Disable Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set	Internal Metering	Multimeter — at J601-9	TUNING CONTROL	METER READING	PROCEDURE
				OSCILLATOR/MULTIPLIER		
1.	C (MULT-1)	3 (MULT-1)	Pin 3	C406	Maximum	Tune C406 for maximum meter reading.
2				C411, C416, C306 C307 and C308	See Procedure	Preset C411 and C416 to a position similar to C406. Next, preset C306, C307 and C308 fully counterclockwise. (Minimum capacity.)
3	D (MULT-2)	4 (MULT-2)	Pin 4	C411, G416, C406	See Procedure	Tune C411 and C416 for maximum meter reading. Next, retune C408, C411 and C416 for maximum meter reading. Then carefully tune C306 for a change in meter reading (peak or dip).
4.	F (MULT-3)	5 (MULT-3)	Pin 7	C306, C307 & C308	See Procedure	Carefully tune C307 and C306 for maximum meter reading. Repeat the procedure. Next, carefully tune C308 for minimum meter reading, and retune C308 for maximum meter reading. Do NOT re-adjust C307 and C306.
				RF SELECTIVITY		
5.	B	2 (IF AMP)	Pin 1	C301 thru C305, A303-C2, (and L2301 if present)	Maximum	Apply an on-frequency signal to the antenna jack, keeping the signal below saturation. Then tune C301 through C305 and A303-C2 for maximum meter reading. In receivers with the UHF pre-amplifier, also tune L2301 for maximum meter reading.
6.	B	2 (IF AMP)	Pin 1	C301 thru C305, A303-C2, C306, C307 and C308 (L2301 if present)	Maximum	Apply an on-frequency signal to the antenna jack and slightly tune C301 through C305, A303-C2, (L2301 if present) for maximum meter reading sensitivity. C306, C307 and C308 also may be tuned slightly (not to exceed 1/4 turn).

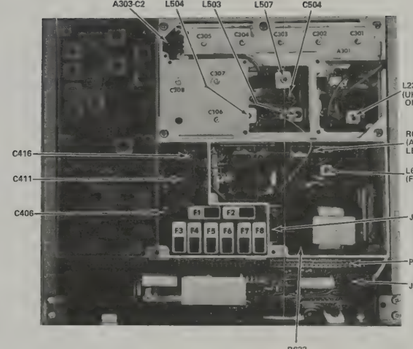


Figure 5 - Test Setup for 20-Hz Double-Trace Sweep Alignment

ICOM FREQUENCY ADJUSTMENT

First, check the FM sensitivity to determine if any adjustment is required. The frequency measurement receiver equipment with an absolute accuracy which is 2 to 10 times better than the tolerance to be established. When performing frequency measurement, the entire radio should be as near as possible to an ambient temperature of 26.5°C (79.7°F).

EACH II ICOMs should be reset only when the measured frequency error exceeds the following limits:

A. ±0.5 PPM, when the radio is at 26.5°C (79.7°F).

B. ±2 PPM at any other temperature within the range -5°C to +55°C (+23°F to +131°F).

C. The specification limit (±2 PPM or ±5 PPM) at any temperature within the ranges -40°C to -5°C (-40°F to -23°F) or +55°C to +60°C (+131°F to (+140°F).

If frequency adjustment is required, lift up the cover on the top of the ICOM to expose the adjustment trimmer. Depending upon the type of frequency measuring equipment that is available, any of the following procedures may be used:

A. DIRECT MEASUREMENT IN THE INJECTION CHAIN

   1. WITH A FREQUENCY COUNTER. "Couple" the frequency at the junction of C414 and L402 on the Oscillator/Multiplier Board (or, if more convenient, at the junction of C408 and L403) to the frequency counter. The output from the ICOM itself is not sufficiently sinusoidal for reliable operation with most frequency counters.
   2. WITH A COMMUNICATION MONITOR (for example: Customer Model CM-3). "Monitor" frequency at the junction of C408 and L403 on the Oscillator/Multiplier Board. The frequency monitored at this point is 4 times the ICOM frequency. NOTE: This frequency will not always fall within an available measuring range of all monitors at all receiver operating frequencies.

B. STANDARD "ON FREQUENCY" SIGNAL AT THE RECEIVER INPUT (Connected from a COMMUNICATION MONITOR, for example: Customer Model CM-3).

   1. WITH A FREQUENCY COUNTER. "Couple" the developed IF frequency at the tap of 2SD1-G2 on the IFAS board. The deviation from the nominal IF frequency (11.3 MHz) is 8x as compared to the receiver operating frequency (also in Hz) to calculate error in PPM.
   2. WITH AN 11.3 MHz IF FREQUENCY STANDARD (for example: General Electric Model 4EZ8A10). Loosely couple the IF frequency standard to the IF signal path to heterodyne with the developed IF frequency. The resultant "beat frequency" can be monitored by either of the following methods:

NOTE

To Set ICOM frequency using "beat frequency" method, the temperature should be at 26.5°C (79.7°F). Otherwise, the frequency will be off by the amount shown in Figure 6 (due to the crystal's temperature characteristics), as a function of actual temperature, by the frequency ERROR FACTOR (in PPM) shown in Figure 6.

   a. Audible "beat frequency" from the receiver speaker (this requires careful frequency adjustment of the frequency standard).
   b. Observe "beat frequency" at P904-4 with an Oscilloscope.
   c. With GE TEST SET (Meter Position 8) connected to J601 on the IFAS Board, visually observe the "beat frequency" indicated by meter movement.

The frequency of the "beat" is the frequency error, related to the IF frequency. This deviation, in Hz, is compared to the receiver operating frequency, also in Hz, to calculate the error in PPM.

NOTE

The FM Detector output (meter position 4 of the test set) has a DC voltage of -0.2 to 0.3 Volt with no on-frequency signal or under no-signal conditions and is provided for tuning the discriminator transformer. The sensitivity of this meter reading is about 0.9 per kHz as read on a GE Test Set's meter position 4, or 0.1 V per kHz as measured with a VTVM at P904-3 or J601-9 on the IFAS board) is inadequate for oscillator frequency setting.

If the radio is at an ambient temperature of 26.5°C (79.7°F) set the oscillator for the correct mixer frequency (150 MHz ± 0 Hz).

If the radio is set at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

   A. To hold setting error to ±0.5 PPM (which is considered reasonable for 3 PPM ICOMS):
      1. Maintain the radio at 26.5°C (80°C) and set the oscillator per the mixer injection frequency, or
      2. Maintain the radio at 30.5°C (86°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 6.
   B. To hold setting error to ±0.25 PPM (which is considered reasonable for 2 PPM ICOMS): Maintain the unit at 26.5°C (80°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 6.

For example: Assume the ambient temperature of the radio is 34.5°C (65.4°F), at that temperature, the curve shows a correction factor of 0.3 PPM. (At 150 MHz, 1 PPM is 150 Hz. At 174 MHz, 1 PPM is 174 Hz).

With a mixer injection frequency of 150 MHz, adjust the oscillator for a corrected mixer injection frequency 45 Hz (0.3 X 150 Hz) higher. If a negative correcting factor is obtained (at temperatures above 30.5°C), set the oscillator for the indicated PPM lower than the calculated mixer injection frequency.

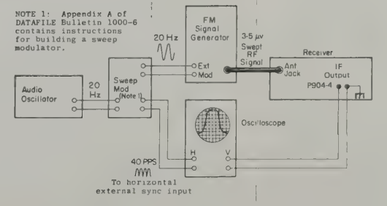
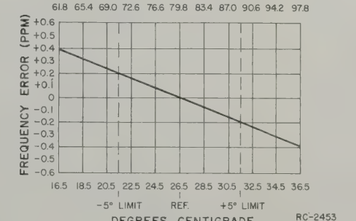


Figure 6 - Frequency Characteristics Vs. Temperature



COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Models 4EX3A11, 4EX8E12 (or 20,000 ohms-per-Volt multimeter with a 1-Volt scale).
2. An 11.3 MHz signal source (GE Test Set Model 4EX3A10). Also a 406-512 MHz signal source with a one-inch piece of insulated wire no larger than .065 inch diameter connected to generator probe.
3. Voltmeter
4. Distortion Analyzer.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect the black plug from the Test Set to receiver metering jack J601, and the red plug to system board metering jack J905. Set the Meter sensitivity switch to the Test 1 (or 1-Volt position on the 4EX8E12).

   For multi-frequency receivers with a frequency spacing up to 0.800 MHz for frequency range of 406-470 MHz, or 0.750 MHz for frequency range of 470-494 MHz, align the receiver on the channel nearest center frequency

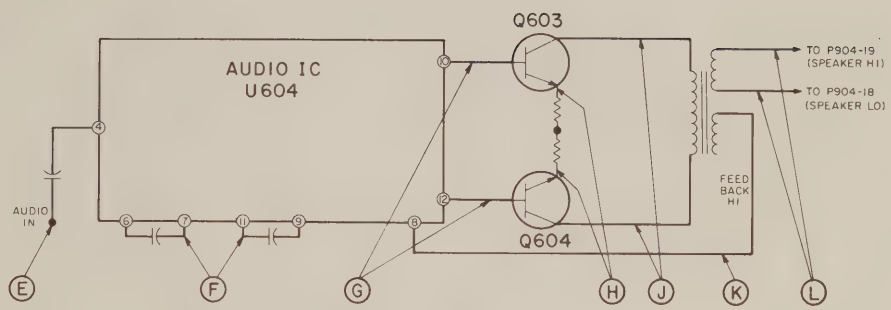
   For multi-frequency receivers with a frequency spacing exceeding the above but no greater than 1.60 MHz for frequency range of 406-470 MHz, or 1.50 MHz for frequency range of 470-494 MHz, or 1.50 MHz for frequency range of 494-512 MHz, align the receiver using a center frequency tune-up. These limits can be extended to 2.00 MHz, 2.30 MHz and 2.00 MHz respectively, with 3 dB degradation in standard receiver specifications.
2. With the Test Set in Position J, check for regulated +10 Volts. With multimeter, measure from J905-3 to J905-9
3. If using multimeter, connect the negative lead to J601-9 (A-).
4. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set	Internal Metering	Multimeter — at J601-9	TUNING CONTROL	METER READING	PROCEDURE
				FM DETECTOR		
1.	A (FM DET)	1 (FM DET)	Pin 2	L603	0.38 Volt	With no signal applied, adjust L603 for a meter reading of approximately 0.38 Volt.
				OSCILLATOR/MULTIPLIER		
2	C (MULT-1)	3 (MULT-1)	Pin 3	C406	Maximum	Tune C406 for maximum meter reading.
3				C411, C416, C306, C307 and C308	See Procedure	Preset C411 and C416 to a position similar to C406. Next, preset C306, C307 and C308 fully counterclockwise. (Minimum capacity.)
4	D (MULT-2)	4 (MULT-2)	Pin 4	C411, C416, C406	See Procedure	Tune C411 and C416 for maximum meter reading. Next retune C408, C411 and C416 for maximum meter reading. Then carefully tune C306 for a change in meter reading (peak or dip).
5.	F (MULT-3)	5 (MULT-3)	Pin 7	C306, C307 & C308	See Procedure	Carefully tune C307 and C306 for maximum meter reading. Repeat the procedure. Next, carefully tune C308 for minimum meter reading, and retune C308 for maximum meter reading. Do NOT re-adjust C307 and C306.
				RF SELECTIVITY		
6.	B (IF AMP)	2 (IF AMP)	Pin 1	C301, C304 and A303-C2	Maximum	Preset A303-C2 to mid-position. Apply an on-frequency signal to the hole adjacent to C304, keeping the signal below saturation. Then tune C301, C304 and A303-C2 for maximum meter reading.
7.	B (IF AMP)	2 (IF AMP)	Pin 1	C304 and C303	Maximum	Apply an on-frequency signal to the hole adjacent to C303, keeping the signal below saturation. Then tune C303 and C304 for maximum meter reading.
8.	B (IF AMP)	2 (IF AMP)	Pin 1	C303 and C302	Maximum	Apply an on-frequency signal to the hole adjacent to C302, keeping the signal below saturation. Then tune C302 and C303 for maximum meter reading.
9.	B (IF AMP)	2 (IF AMP)	Pin 1	C301 thru C305, A303-C2 (and L2301 if present)	Maximum	Apply an on-frequency signal to the antenna jack, keeping the signal below saturation. Then tune C301 through C305 and A303-C2 for maximum meter reading. In receivers with the UHS preamplifier, also tune L2301 for maximum meter reading.
10.	B (IF AMP)	2 (IF AMP)	Pin 1	C301 thru C305, A303-C2, C306, C307 & C308 (L2301 if present)	Maximum	Apply an on-frequency signal to the antenna jack and slightly tune C301 through C305, A303-C2 (and L2301 if present) for best quieting sensitivity. C306, C307 & C308 also may be tuned slightly (not to exceed 1/4 turn).
11.				L603, R608	See Procedure	Remove the Test set metering plug from J601. Apply a 406-512 MHz signal at 1.0 Volt RMS level with 20 Hz deviation to the antenna jack. Tune L603 for maximum voltage at 1.0 kHz and adjust R608 for 1 Volt RMS measured with a VTVM at P904-11 (YEL/SQ BLU) and P904-17 (A-).
				MIXER & IF		
	The mixer and IF circuits have been aligned at the factory and will normally require no further adjustment. If adjustment is necessary, use the procedure outlined in STEP 13.					
	NOTE: Refer to DATAFILE BULLETIN 1000-6 (IF Alignment of Two-Way Radio FM Receivers) for helpful suggestion on how to determine when IF Alignment is required.					
12.				L507, L503, L504 and C504		Connect scope, signal generator, and probe as shown in Figure 7. Set signal generator level for 3 to 5 microvolts modulated with 20 Hz at 10 kHz deviation. Adjust coils between P904-4 (or J601-11) and A-, tune L507, L503, L504 and C504, for double trace as shown on scope pattern
13.					See Procedure	Check to see that modulation acceptance bandwidth is greater than 8? kHz.
				SQUELCH ADJUST		
14.				R622		Squelch adjust control R622 (if present) is preset at the factory. If further adjustment is required, adjust R622 on the IFAS board for best squelch operation. NOTE: Maximum squelch decreases with increasing resistance.

DIO & SQUELCH WAVEFORMS

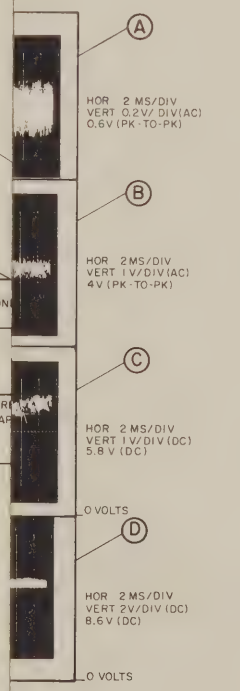
MENT REQUIRED:
CILLOSCOPE
DICATED BY ARROW.
SIGNAL GENERATOR
Hz GENERATOR

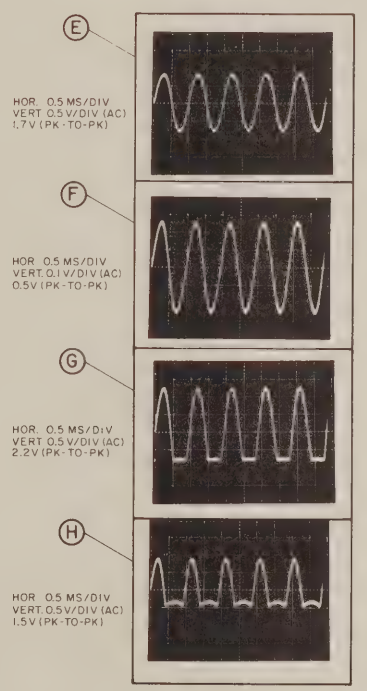


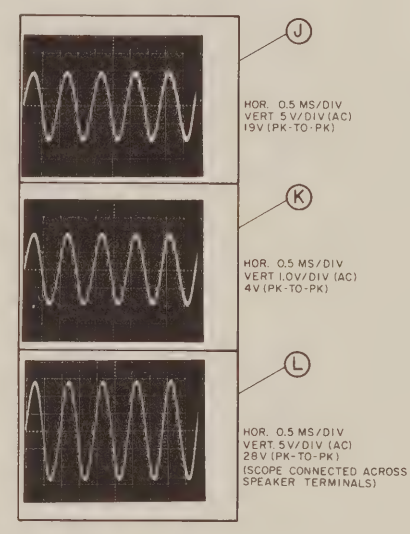
AUDIO CIRCUIT CHECK WITH STANDARD SIGNAL
(1000 MICROVOLTS AT RECEIVER FREQ:
MODULATED BY 1 KHz WITH 3.0 KHz DEVIATION)

PRELIMINARY STEPS
1. SET VOLUME CONTROL FOR 9.8 VOLTS ACROSS 8-OHM, 12 WATT LOAD
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. CHECK WAVEFORMS (E) THRU (L)

SY
NO SUPPLY VOL
NO REGULATED
LOW IF READIN
LOW OSCILLATO READINGS
LOW RECEIVER
IMPROPER SQUE
LOW OR DISTOR







RC-2881D

TEST PROCEDURES

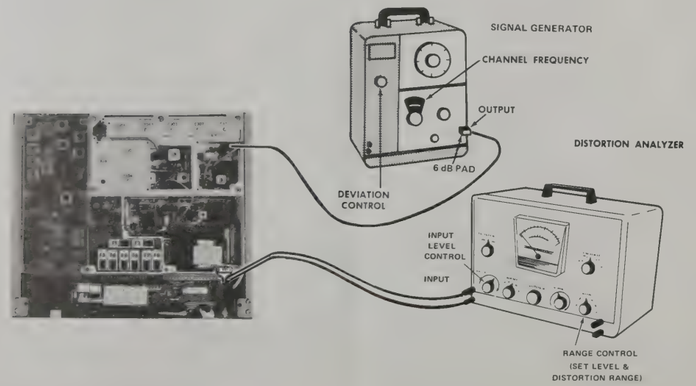
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer
- Signal Generator
- 6-dB attenuation pad, and 8.0-ohm, 15-Watt resistor

PRELIMINARY ADJUSTMENTS

1. Connect the test equipment to the receiver as shown for all steps of the receiver Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.



STEP 1
AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Apply a 1,000-microvolt, on-frequency test signal modulated by 1,000 hertz with ±3.0 kHz deviation to antenna jack A301-J1.

B. With 15-Watt Speaker (Mobile)

5-Watt (Station):

Disconnect speaker lead pin from Systems Plug P701-11 (on rear of Control Unit).

Connect an 8.0-ohm, 15-Watt load resistor from P904-19 to P904-18 or from P701-4 to P701-17 (SPEAKER Hi) on the System Plug. Connect the Distortion Analyzer input across the resistor as shown.

OR

With Handset:

Lift the handset off of the hookswitch. Connect the Distortion Analyzer input from P904-19 to P904-18.

C. Adjust the VOLUME control for 12-Watt output 9.8 VRMS (Mobile) or 6.3 VRMS (5-Watt Station) using the Distortion Analyzer as a Voltmeter.

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 3%. If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 3%, or maximum audio output is less than 12.0 Watts, make the following checks:

E. Battery and regulator voltage---low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)

F. Audio Gain (refer to Receiver Troubleshooting Procedure).

G. FM Detector Alignment (refer to Receiver Alignment).

STEP 2
USABLE SENSITIVITY (12-dB SINAD)

If STEP 1 checks out properly, measure the receiver sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3.0-kHz deviation to A301-J1.

B. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

C. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on the 30% range.

D. While reducing the signal generator output, switch the RANGE control from SET LEVEL to the distortion range until a 12-dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least 6.0 Watts (6.9 Volts RMS across the 8.0-ohm receiver load using the Distortion Analyzer as a VTVM).

F. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, check the alignment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 3
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEPS 1 and 2 check out properly, measure the bandwidth as follows:

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12-dB SINAD measurement.

B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 kHz.

SERVICE CHECK

If the Modulation Acceptance Bandwidth test does not indicate the proper width, make gain measurements as shown on the Receiver Troubleshooting Procedure.

STEP 1 - QUICK CHECKS

TEST SET CHECKS

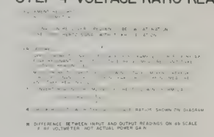
These checks are typical voltage readings measured with GE Test Set Model 4EX241 in the Test 1 position, or Model 4EX8K12 in the 1-Volt position.

Metering Position	Reading With No Signal In	Reading With 8-10 Microvolts Unmodulated (2 microvolts with preamp)
A (FM-DET)	Approximately 0.38 VDC	
B (IF Amp)		0.1 VDC
C (Mult-1)	0.4 VDC	
D (Mult-2)	0.4 VDC	
F (Mult-3)	0.1 VDC	
J (Neg. +10 Volts at System Metering jack)	+10 VDC	

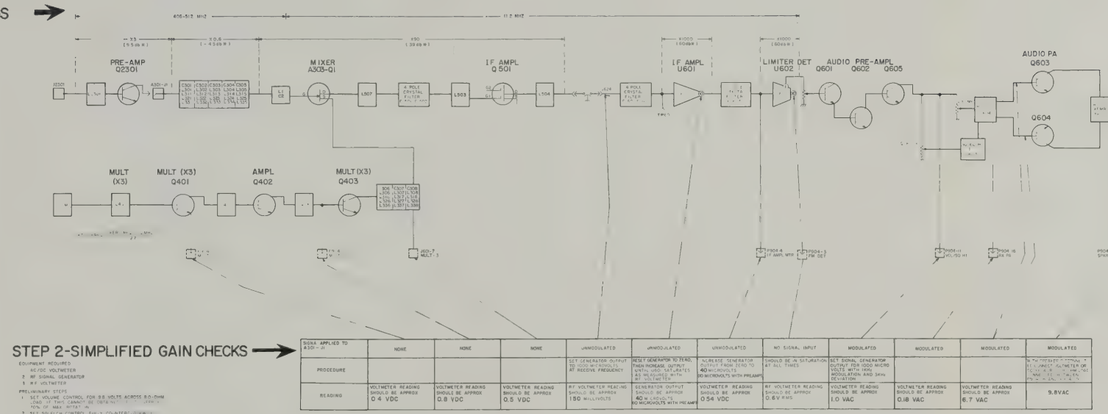
SYMPTOM CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections and continuity of supply leads. Check fuse and replace if blown. Check receiver for short circuits
NO REGULATED 10-VOLTS	• Check the 12-Volt supply. Then check 10-Volt regulator circuit. (See Troubleshooting Procedure for 10-Volt Regulator).
LOW IF READING	• Check supply voltages and then check oscillator readings at P904-1 & -2 as shown in STEP 2. • Make SIMPLIFIED GAIN CHECKS from Mixer through Limiter Detector stages as shown in STEP 2.
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator/Multiplier chain. (Refer to Front End Alignment Procedure). • Check voltage readings of Oscillator/Multiplier chain (Q401, Q402, Q403).
LOW RECEIVER SENSITIVITY	• Check Front End Alignment. (Refer to Receiver Alignment Procedure). • Check antenna connections, cable and antenna switch • Check Oscillator injection voltage • Check voltage readings of IF Amplifiers. • Make SIMPLIFIED GAIN CHECKS (STEP 2).
IMPROPER SQUELCH OPERATION	• Check voltages on Schematic Diagram • Make gain and waveform checks with noise • Make gain and waveform checks with 6 kHz signal • Check discrete components in the squelch circuit • Replace IC circuit U603.
LOW OR DISTORTED AUDIO	• Check voltages on Schematic Diagram. • Make gain and waveform checks • Check receiver and alignment and FM-DET output. • Check Q601, Q602 Q605 and other discrete components • Replace IC circuit U604

STEP 4-VOLTAGE RATIO READINGS

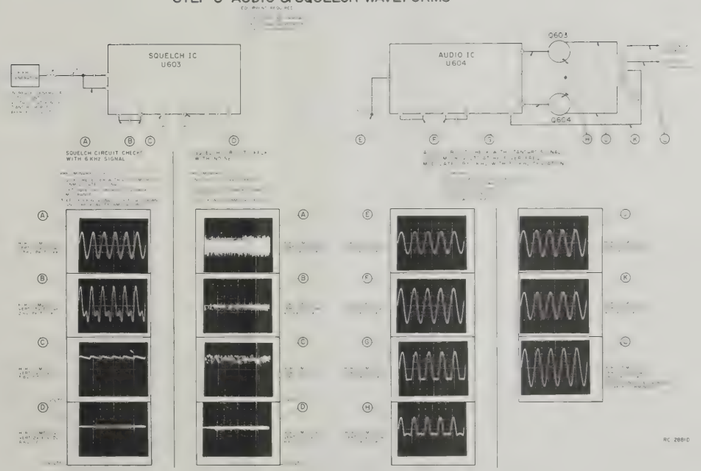


STEP 2-SIMPLIFIED GAIN CHECKS



SIGNAL APPLIED TO A30-J1	NONE	NONE	NONE	UNMODULATED	UNMODULATED	UNMODULATED	NO SIGNAL INPUT	MODULATED	MODULATED	MODULATED	MODULATED
PROCEDURE				SET GENERATOR OUTPUT TO 1000 MICROVOLTS AT RECEIVE FREQUENCY	RESET GENERATOR TO READ THEN INCREASE OUTPUT UNTIL 1000 MICROVOLTS AT VOLTMETER	INCREASE GENERATOR OUTPUT FROM 2 TO 10 MICROVOLTS AS NECESSARY WITH PREAMP	SHOULD BE IN SATURATION AT ALL TIMES	SET SIGNAL GENERATOR OUTPUT FOR 1000 MICRO VOLTS WITH 1 kHz MODULATION AND 3kHz DEVIATION			
READING	VOLTMETER READING SHOULD BE APPROX 0.4 VDC	VOLTMETER READING SHOULD BE APPROX 0.8 VDC	VOLTMETER READING SHOULD BE APPROX 0.5 VDC	RF VOLTMETER READING SHOULD BE APPROX 150 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 40 MICROVOLTS WITH PREAMP, 80 MICROVOLTS WITHOUT	VOLTMETER READING SHOULD BE APPROX 0.54 VDC	RF VOLTMETER READING SHOULD BE APPROX 0.8V RMS	VOLTMETER READING SHOULD BE APPROX 1.0 VAC	VOLTMETER READING SHOULD BE APPROX 0.68 VAC	VOLTMETER READING SHOULD BE APPROX 6.7 VAC	9.8VAC

STEP 3-AUDIO & SQUELCH WAVEFORMS



MAINTENANCE MANUAL

406-512 MHz RF ASSEMBLIES 19D417075G9-G38, 19B233690G1-G20 AND IF FILTER BOARDS 19C320523G2-G3, 19C331148G1-G2

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SCHEMATIC DIAGRAMS	
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IF Filter Board	5, 8 & 10
PARTS LIST AND PRODUCTION CHANGES	11 - 14

DESCRIPTION

The RF Assembly uses five tuned helical resonators to provide front end RF selectivity with no gain. A UHS pre-amplifier assembly is available that can be used with the receiver to improve sensitivity.

Mixer board A303 uses the RF signal from the RF Assembly and the mixer injection frequency from the oscillator multiplier board to generate the IF frequency.

CIRCUIT ANALYSIS

RF ASSEMBLY

PRE-AMPLIFIER

The pre-amplifier is present only in UHS receivers, and uses a bi-polar transistor to provide approximately 10 dB gain.

RF from the antenna is link-coupled through helical resonator L2301 to the base of Class A pre-amplifier Q2301. L2301 matches the 50 ohm input to the base of Q2301. The amplified output is coupled through L2302, and connected through W2301 to J1 on Antenna Input Board A301. P2301 connects to J502 on the IF-Filter Board for regulated +10 Volt supply voltage.

ANTENNA INPUT A301A/A301B/A301C

An RF signal from the antenna or UHS pre-amplifier is applied to A301 which provides an AC ground between vehicle ground and receiver A-. Resistor R1 prevents a static charge from building up on the vehicle antenna. The output of A301 is coupled through five high Q helical resonators that provide the front end RF selectivity. The helicals are tuned to the incoming frequency by C301 through C305.

MIXER A304

The mixer uses a FET (Q1) as the active device. The FET mixer provides a high input impedance, high power gain and an output relatively free of harmonics (low in intermodulation products).

In the mixer stage, RF from the helical resonators is coupled through L1 and C2 which matches the RF output to the gate of mixer Q501. Injection voltage from the multiplier-selectivity stages is applied to the source of the mixer. The 11.2 MHz mixer IF output signal is coupled from the drain of Q1 through Cable W1 to J501 on the IF Filter board.

MAINTENANCE MANUAL

406-512 MHz RF ASSEMBLIES 19D417075G9-G38, 19B233690G1-G20 AND IF FILTER BOARDS 19C320523G2-G3, 19C331148G1-G2

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Mixer board A303 uses the RF signal from the RF Assembly and the mixer injection frequency from the oscillator multiplier board to generate the IF frequency.

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IF-FILTER

CRYSTAL FILTER

The output of A303-Q1 is coupled through a tuned circuit (L507 & C515) which matches the output to the input of the four-pole monolithic crystal filter. The highly-selective crystal filter (FL501 & FL502) provides the first portion of the receiver IF selectivity. The output of the filter is coupled through impedance-matching network L503 and C511 to the IF amplifier.

Service Note: Variable capacitor C504 does not require adjustment when performing normal alignment. If the four-pole monolithic crystal filter is replaced, then adjustment of C504 is necessary for optium IF response.

IF AMPLIFIER

IF Amplifier Q501 is a dual-gate FET. The filter output is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q501 is coupled through a network (L504 & C509) that matches the amplifier output to the crystal filter on the IFAS board. The output of the IF-Filter board is applied to the IFAS board through feed-through capacitor C325.

Supply voltage for the RF amplifier and IF-Filter board is supplied from the IFAS board through feed-through capacitor C326.

MODIFICATIONS

Some of the RF amplifier assemblies are not compatible with some of the IF-Filter boards without a modification to the RF assembly mixer board. Refer to the compatibility chart shown below.

RF ASSEMBLY	COMPATIBLE WITH IF-FILTER BOARD
19D417075G9-G18	19C320523G2
19B233690G1-G10	19C331148G1

The following modifications are provided to permit field replacement using incompatible boards or assemblies. Refer to the applicable Outline Diagram for component location and printed wiring board layout.

- To modify RF assemblies 19D417075G9-G18 for operation with IF-Filter board 19C331148G1: add frequency select network Z1 from the drain of mixer FET Q1 to ground. Refer to the Parts List in this manual for the correct part number.
- To modify RF assemblies 19B233690G1-G10 for operation with IF-Filter board 19C320523G2: clip out and remove frequency select network Z1 on the mixer board.

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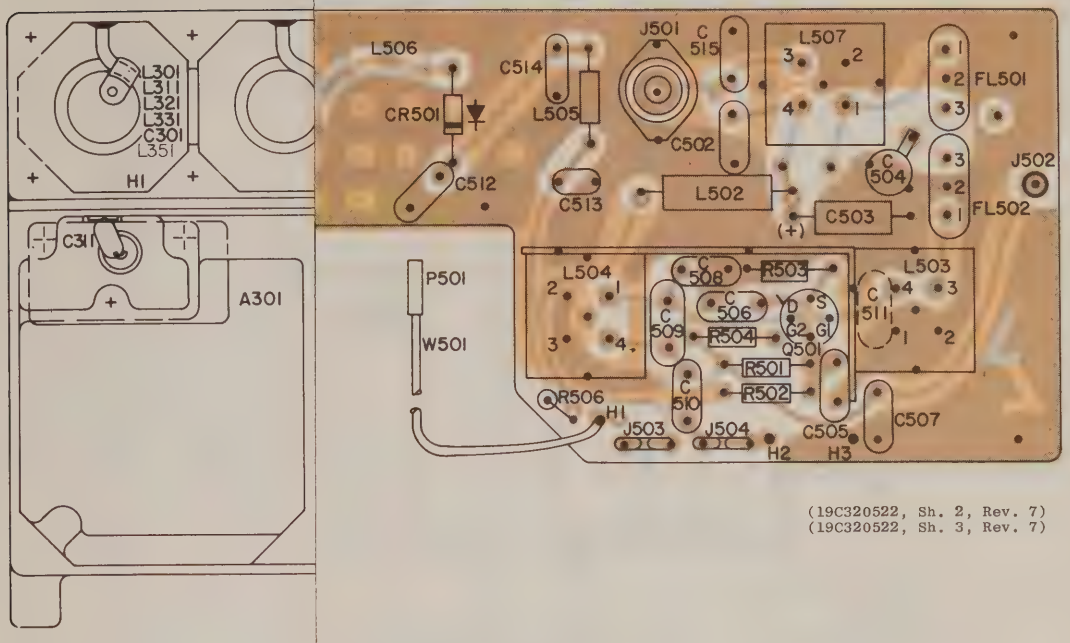
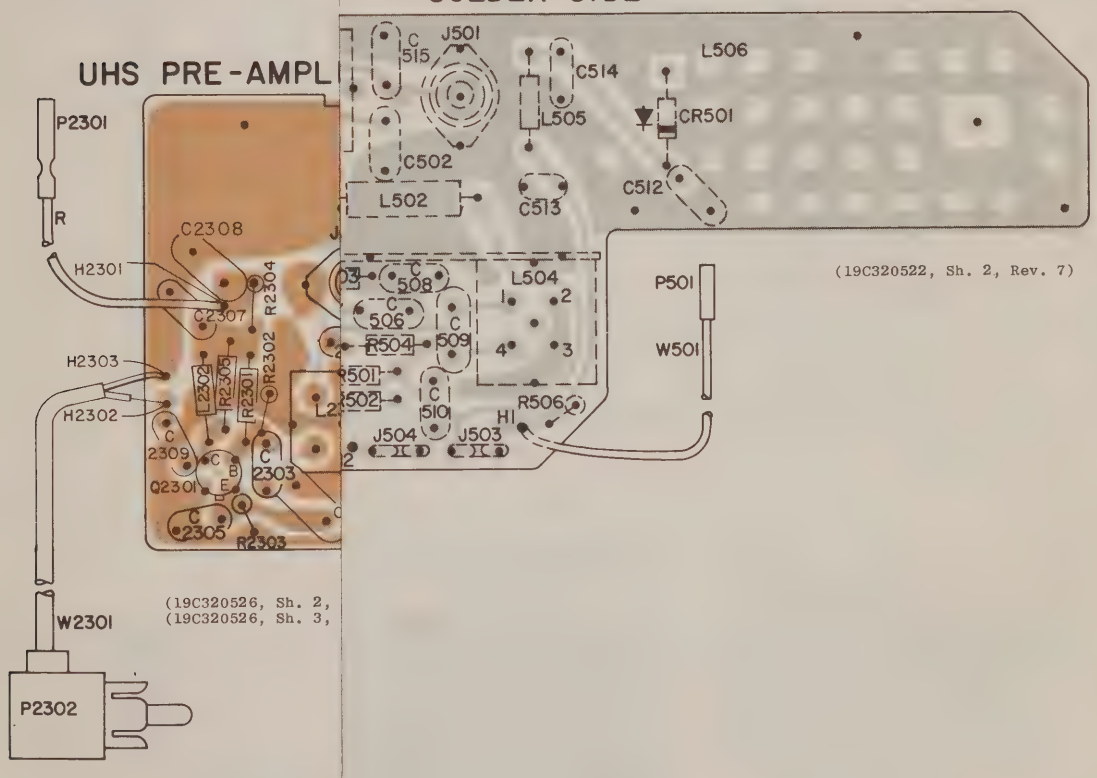
IF-FILTER BOARD

COMPONENT SIDE



(19C320522, Sh. 2, Rev. 7)
(19C320522, Sh. 3, Rev. 7)

SOLDER SIDE



(19C320522, Sh. 2, Rev. 7)

(19C320526, Sh. 2,
(19C320526, Sh. 3,

OUTLINE DIAGRAM

406—512 MHz, RF ASSEMBLY BOARD
19D417075G9-G18, IF FILTER BOARD
19C320523G2 AND MIXER 19B227059G2

****

IF-FILTER

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IF Amplifier Q501 is a dual-gate FET. The filter output is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q501 is coupled through a network (L504 & C509) that matches the amplifier output to the crystal filter on the IFAS board. The output of the IF-Filter board is applied to the IFAS board through feed-through capacitor C325.

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- To modify RF assemblies 19B233690G1-G10 for operation with IF-Filter board 19C320523G2: clip out and remove frequency select network Z1 on the mixer board.

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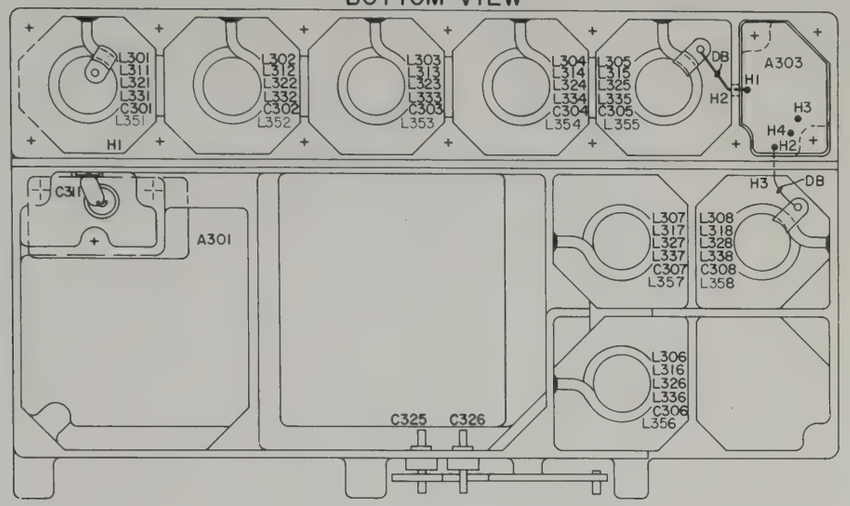
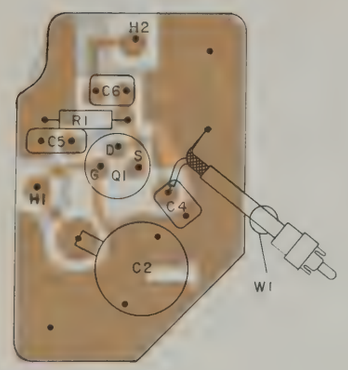
RF ASSEMBLY BOTTOM VIEW

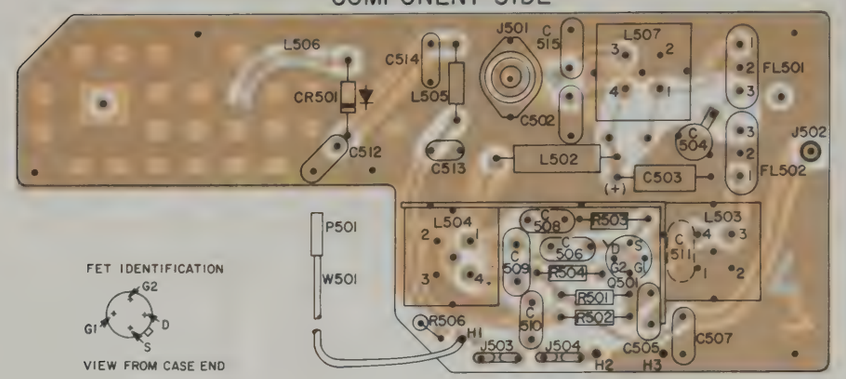


MIXER A304



(19D429194, Sh. 2, Rev. 1)
(19D429194, Sh. 3, Rev. 1)

IF-FILTER BOARD COMPONENT SIDE

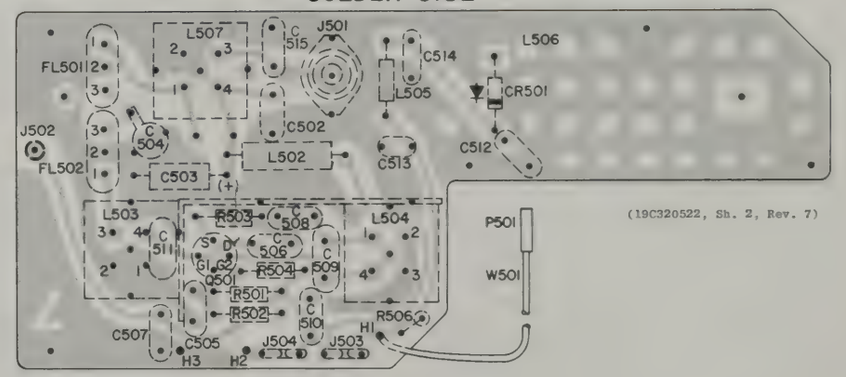


FET IDENTIFICATION

VIEW FROM CASE END

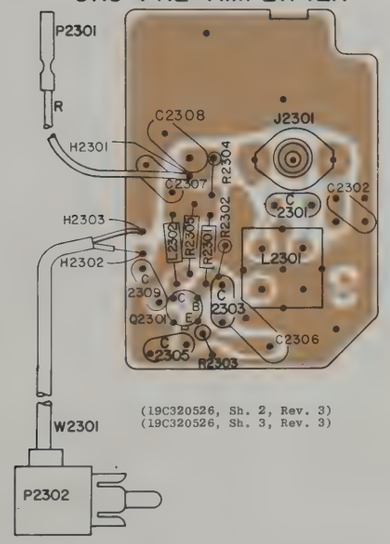
(19C320522, Sh. 2, Rev. 7)
(19C320522, Sh. 3, Rev. 7)

SOLDER SIDE



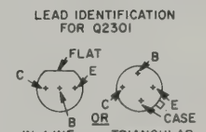
(19C320522, Sh. 2, Rev. 7)

UHS PRE-AMPLIFIER



(19C320526, Sh. 2, Rev. 3)
(19C320526, Sh. 3, Rev. 3)

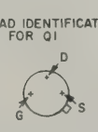
LEAD IDENTIFICATION FOR Q2301



IN-LINE TRIANGULAR
VIEW FROM CASE END

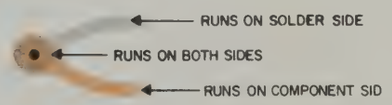
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.

LEAD IDENTIFICATION FOR Q1



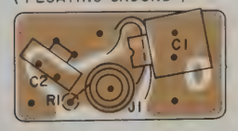
TRIANGULAR
VIEW FROM CASE END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.



A301A ANT INPUT

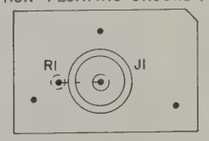
(FLOATING GROUND)



(19B219941, Sh. 2, Rev. 0)
(19B219941, Sh. 3, Rev. 0)

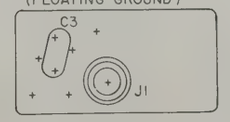
A301B ANT INPUT

(NON- FLOATING GROUND)



A301C ANT INPUT

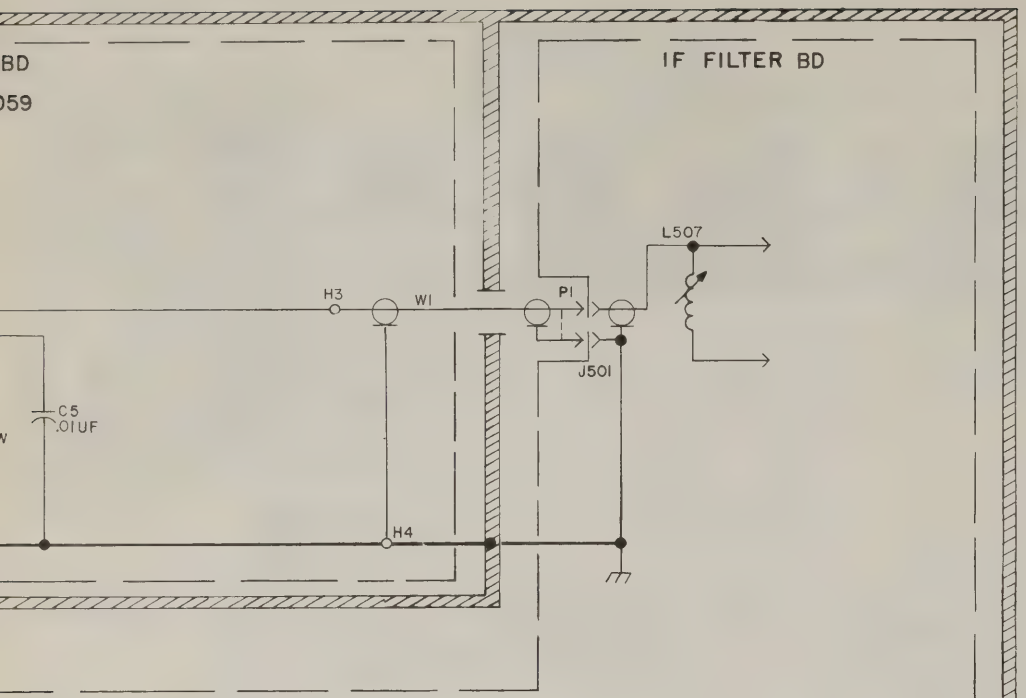
(FLOATING GROUND)

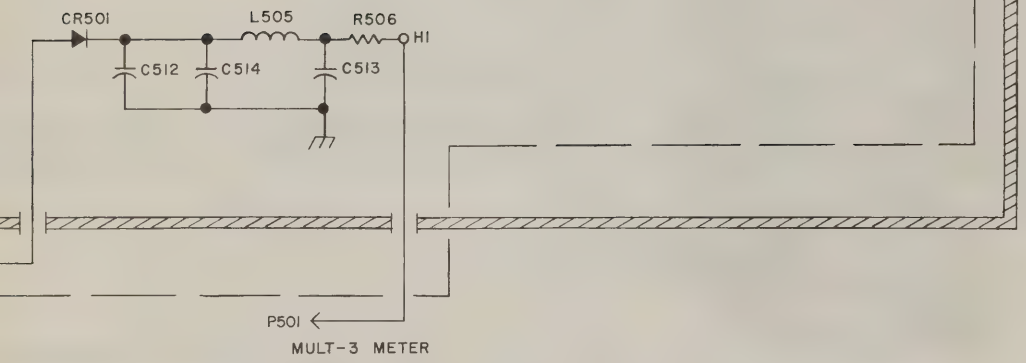


(19D423794, Rev. 7)

OUTLINE DIAGRAM

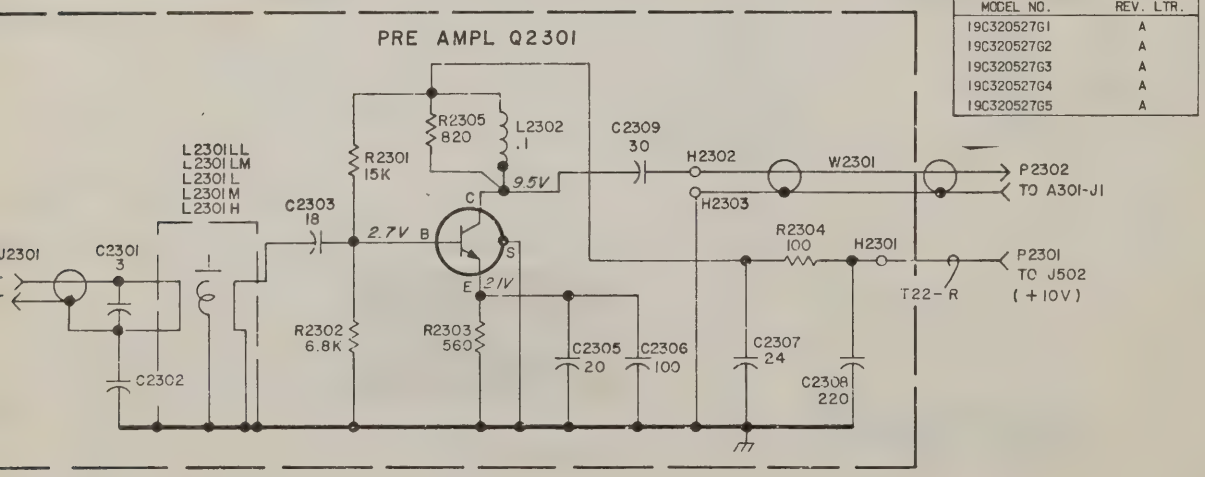
406—512 MHz, RF ASSEMBLY BOARD
19D417075G9-G18, IF FILTER BOARD
19C320523G2 AND MIXER 19B227059G2
****

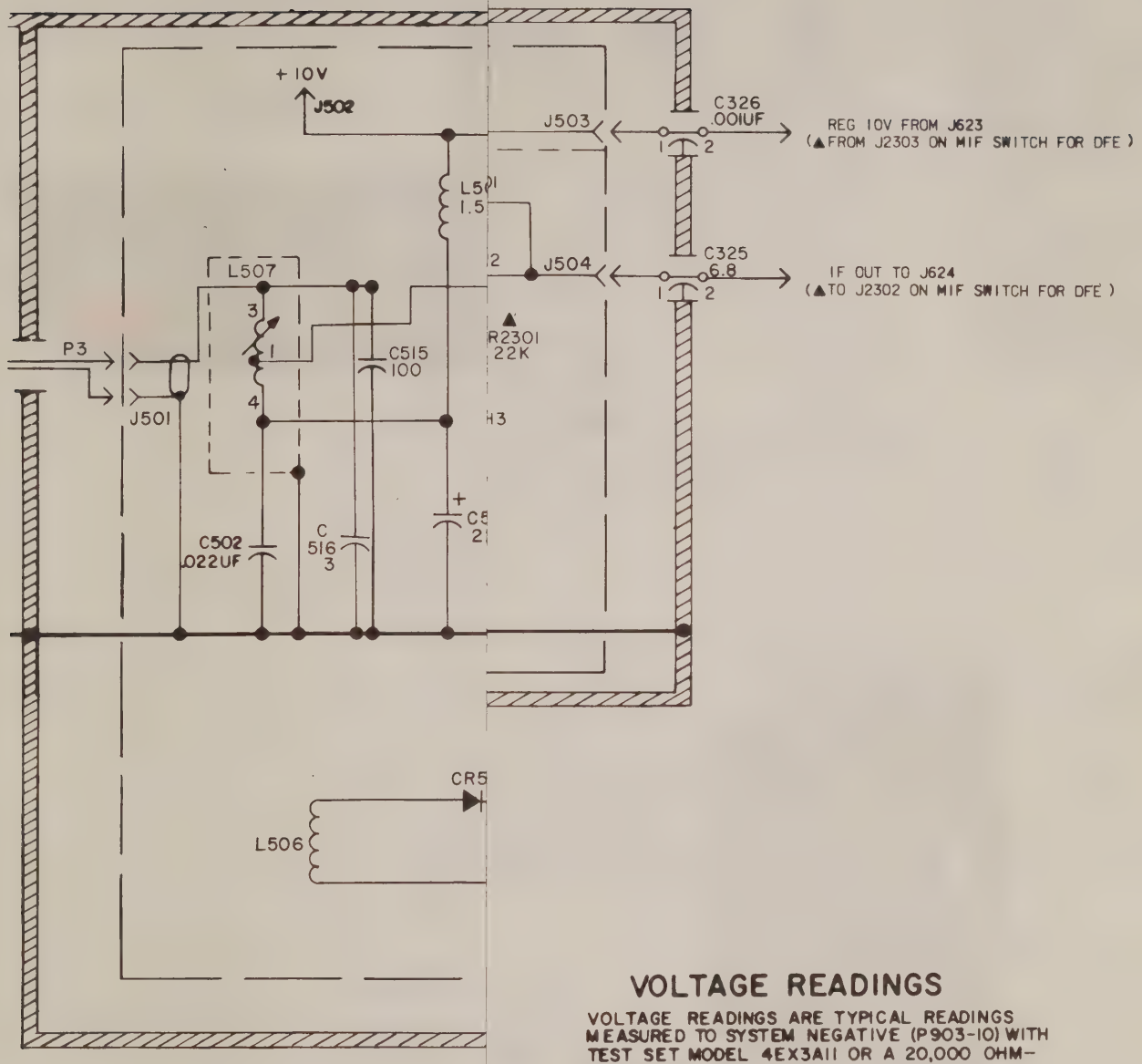




UHS PRE-AMPLIFIER

MODEL NO.	REV. LTR.
19C320527G1	A
19C320527G2	A
19C320527G3	A
19C320527G4	A
19C320527G5	A





VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

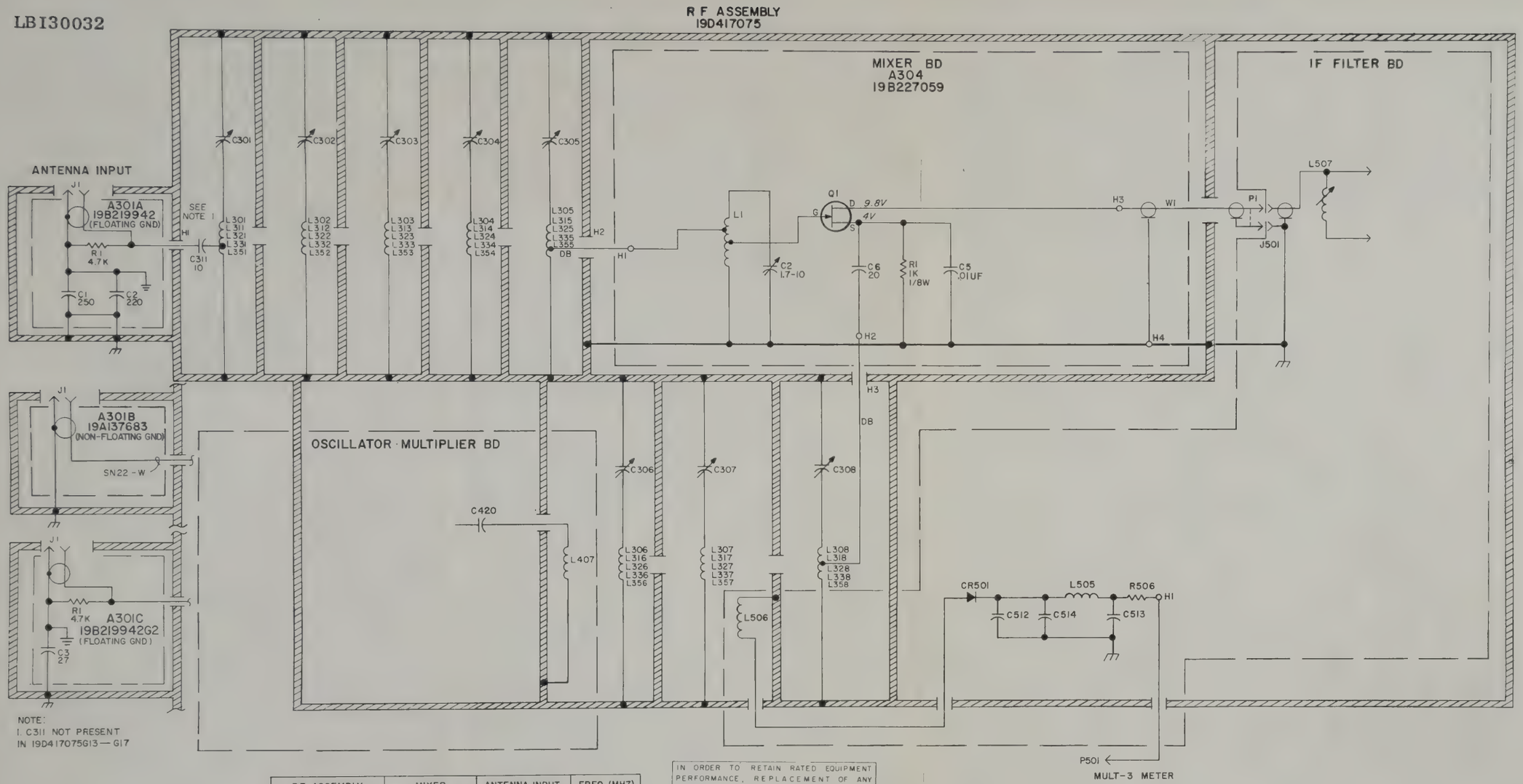
INDICATES A-

INDICATES VEHICLE GROUND

SCHEMATIC DIAGRAM

IF FILTER BOARD 19C320523G2

****



NOTE:
1. C311 NOT PRESENT IN 19D417075G13 — G17

RF ASSEMBLY	REV LTR	MIXER	REV LTR	ANTENNA INPUT	REV LTR	FREQ (MHZ)
19D417075G9	D	19B227059G2	–	19B219942G2	–	406-420(LL)
19D417075G10	C	19B227059G2	–	19B219942G1	–	450-470(L)
19D417075G11	C	19B227059G2	–	19B219942G1	–	470-494(M)
19D417075G12	C	19B227059G2	–	19B219942G1	–	494-512 (H)
19D417075G13	A	19B227059G2	–	19A137683G2	–	406-420(LL)
19D417075G14	A	19B227059G2	–	19A137683G2	–	450-470(L)
19D417075G15	A	19B227059G2	–	19A137683G2	–	470-494(M)
19D417075G16	A	19B227059G2	–	19A137683G2	–	494-512 (H)
19D417075G17	–	19B227059G2	–	19A137683G2	–	420-450(LM)
19D417075G18	–	19B227059G2	–	19B219942G1	–	420-450(LM)

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

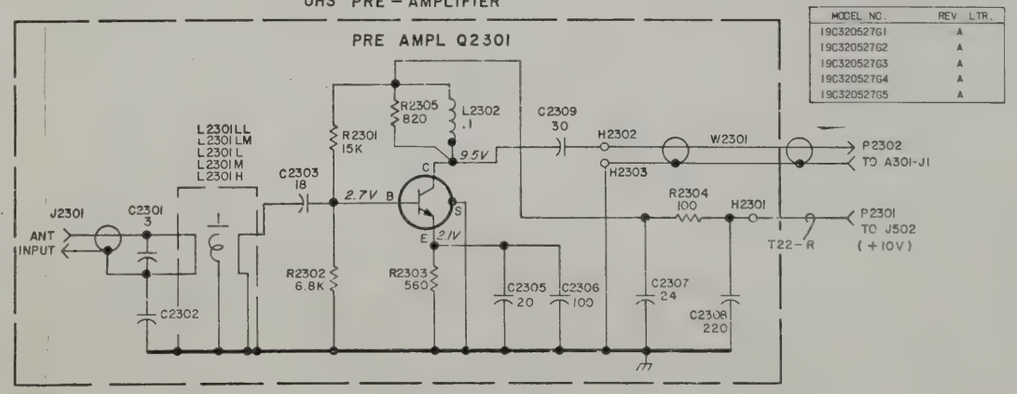
⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

COMPONENT VALUE TABLE					
COMP DESIG	LL	LM	L L	M	H
RF FREQ (MHZ)	406-420		450-470	470-494	494-512
L301-L308	X				
L311-L318			X		
L321-L328				X	
L331-L338					X
L351-L358		X			

(19D423520, Rev. 8)

UHS PRE-AMPLIFIER

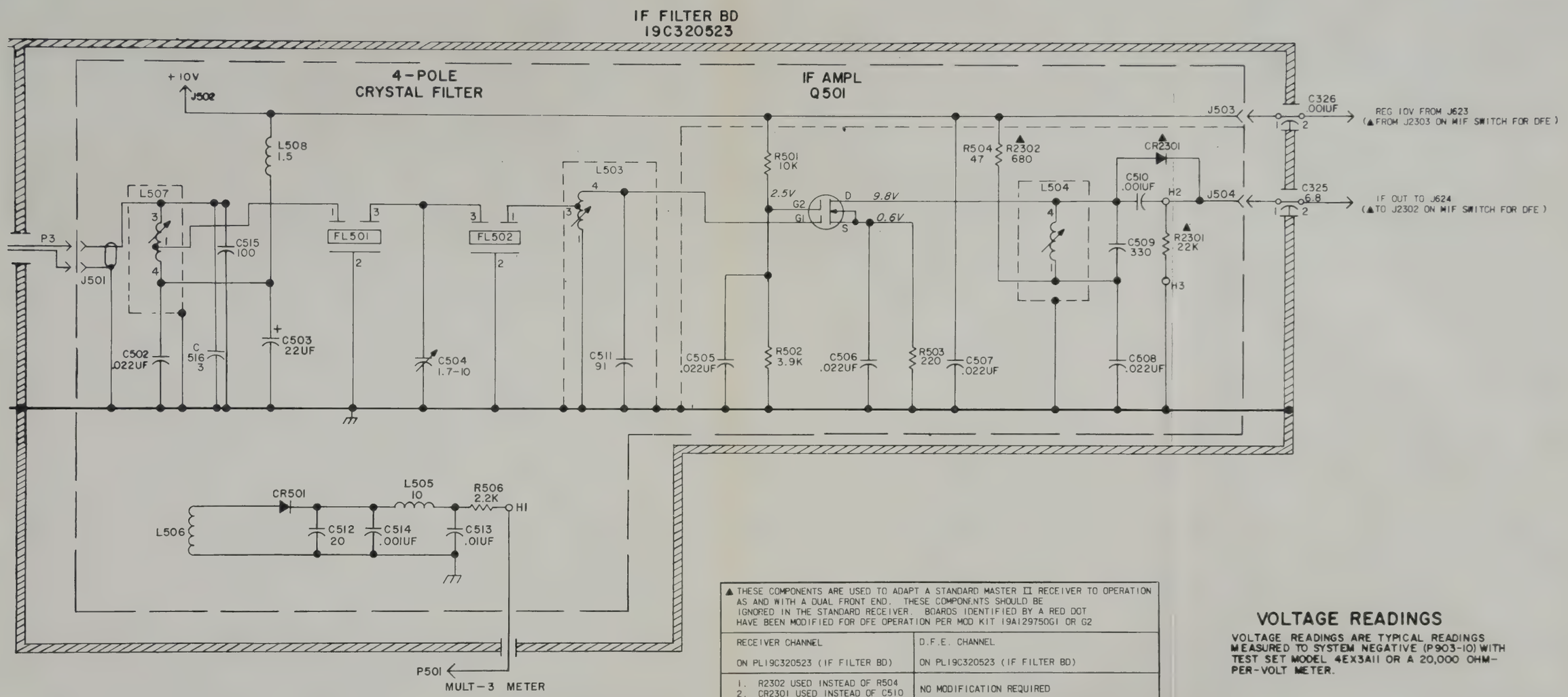


MODEL NO.	REV LTR.
19C320527G1	A
19C320527G2	A
19C320527G3	A
19C320527G4	A
19C320527G5	A

(19B226008, Rev. 7)

SCHEMATIC DIAGRAM

406—512 MHz, RF ASSEMBLY
19D417075G9-G18 AND UHS
PRE-AMPLIFIER 19C320527G1-G5
****



▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD MASTER II RECEIVER TO OPERATION AS AND WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2	
RECEIVER CHANNEL ON PL19C320523 (IF FILTER BD)	D.F.E. CHANNEL ON PL19C320523 (IF FILTER BD)
1. R2302 USED INSTEAD OF R504 2. CR2301 USED INSTEAD OF C510 3. R2301 ADDED BETWEEN H2 & H3.	NO MODIFICATION REQUIRED
	SEE OSC/MULT BD FOR OTHER DFE CHANGES
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G1.	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

	REV LETTER
IF FILTER BD	*
19C320523G2	A

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏦ INDICATES A-

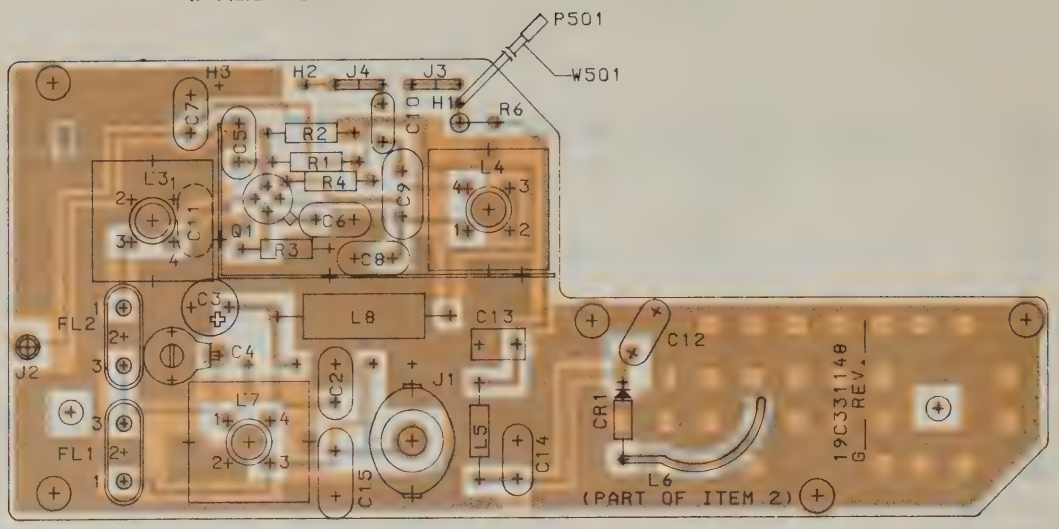
⏚ INDICATES VEHICLE GROUND

SCHEMATIC DIAGRAM

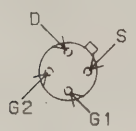
IF FILTER BOARD 19C320523G2

****

IF FILTER BOARD



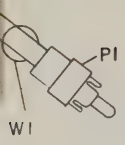
LEAD IDENTIFICATION
FOR Q1



IN-LINE TRIANGULAR
TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

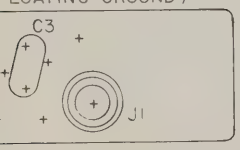
(19C331201, Rev. 0)
(19A143759, Sh. 1, Rev. 0)
(19A143759, Sh. 2, Rev. 1)



ND

AND NOT
RMINING
NTIFICATION.
ER LEAD.

A301C
NT INPUT
FLOATING GROUND)



LDER SIDE

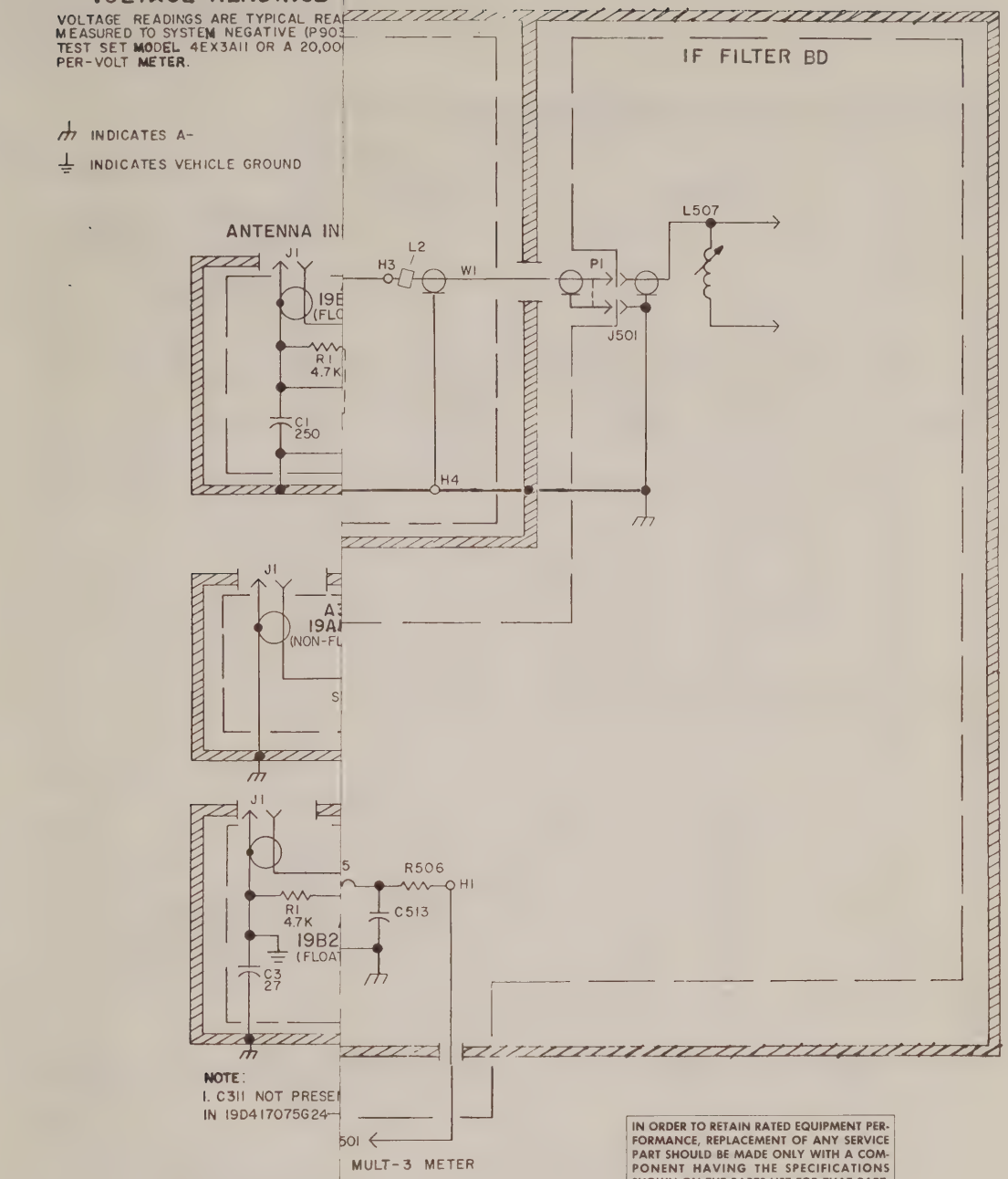
MPONENT SIDE

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL REA
MEASURED TO SYSTEM NEGATIVE (P903
TEST SET MODEL 4EX3A11 OR A 20,00
PER-VOLT METER.

⏚ INDICATES A-

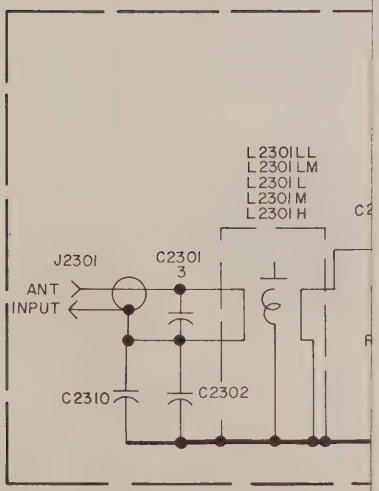
⏚ INDICATES VEHICLE GROUND



NOTE:
1. C311 NOT PRESE
IN 19D417075G24-

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

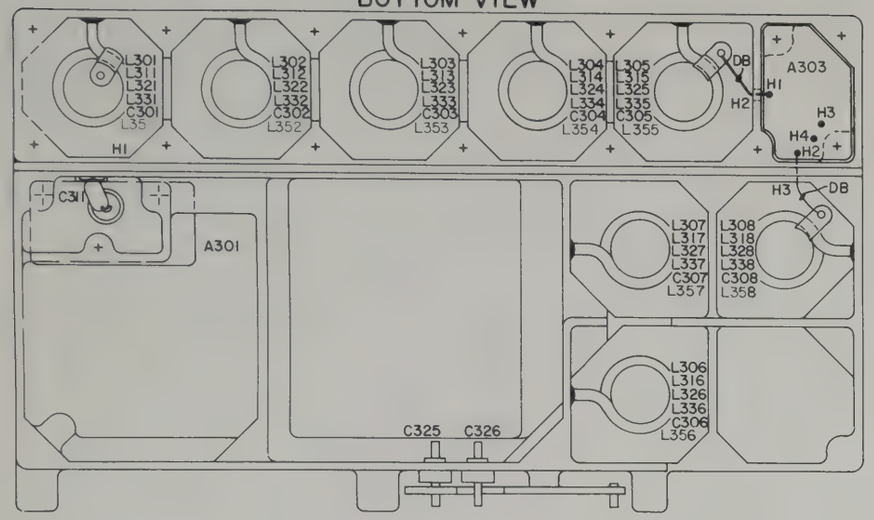
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.



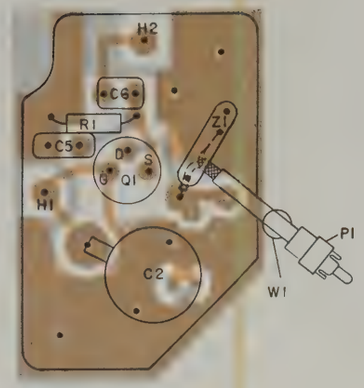
SCHEMATIC DIAGRAM

406—512 MHz, RF ASSEMBLY
19D417075G19-G28
WITH MIXER BOARD 19B227059G3 AND
UHS PRE-AMPLIFIER 19C320527G1-G5

RF ASSEMBLY BOTTOM VIEW

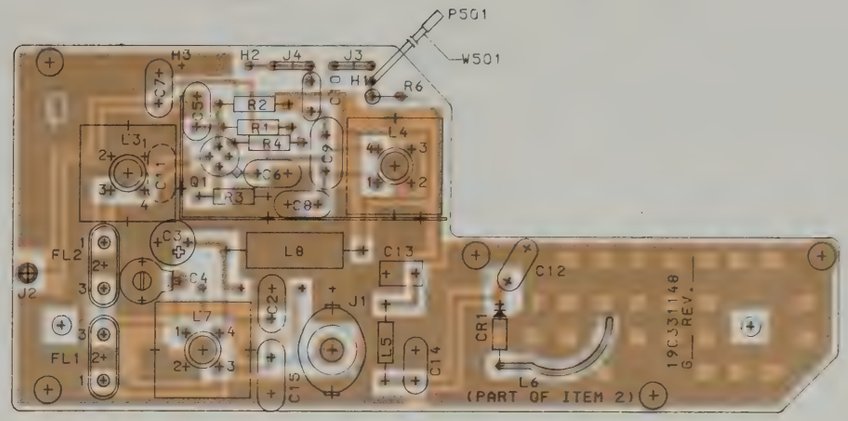


MIXER A305

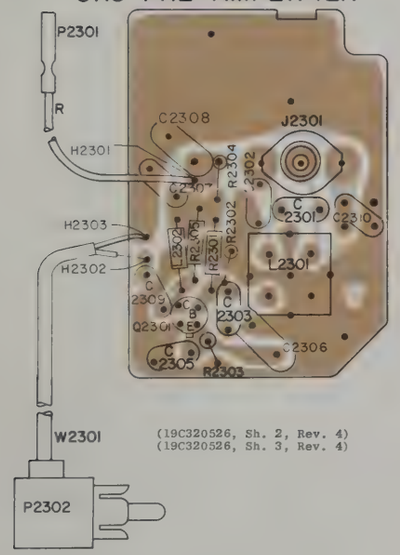


(19B233936, Rev. 0)
(19D429194, Sh. 2, Rev. 3)
(19D429194, Sh. 3, Rev. 3)

IF FILTER BOARD

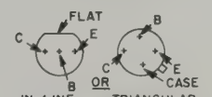


UHS PRE-AMPLIFIER



(19C320526, Sh. 2, Rev. 4)
(19C320526, Sh. 3, Rev. 4)

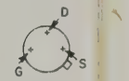
LEAD IDENTIFICATION FOR Q2301



VIEW FROM CASE END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.

LEAD IDENTIFICATION FOR Q1

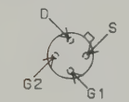


TRIANGULAR

VIEW FROM CASE END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.

LEAD IDENTIFICATION FOR Q1



IN-LINE TRIANGULAR

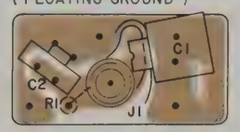
TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19C331201, Rev. 0)
(19A143759, Sh. 1, Rev. 0)
(19A143759, Sh. 2, Rev. 1)

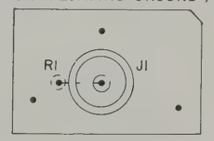
A301A ANT INPUT

(FLOATING GROUND)



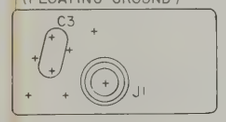
A301B ANT INPUT

(NON- FLOATING GROUND)

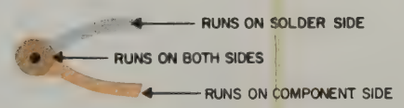


A301C ANT INPUT

(FLOATING GROUND)



(19B219941, Sh. 2, Rev. 1)
(19B219941, Sh. 3, Rev. 1)



(19D423794, Rev. 10)

OUTLINE DIAGRAMS

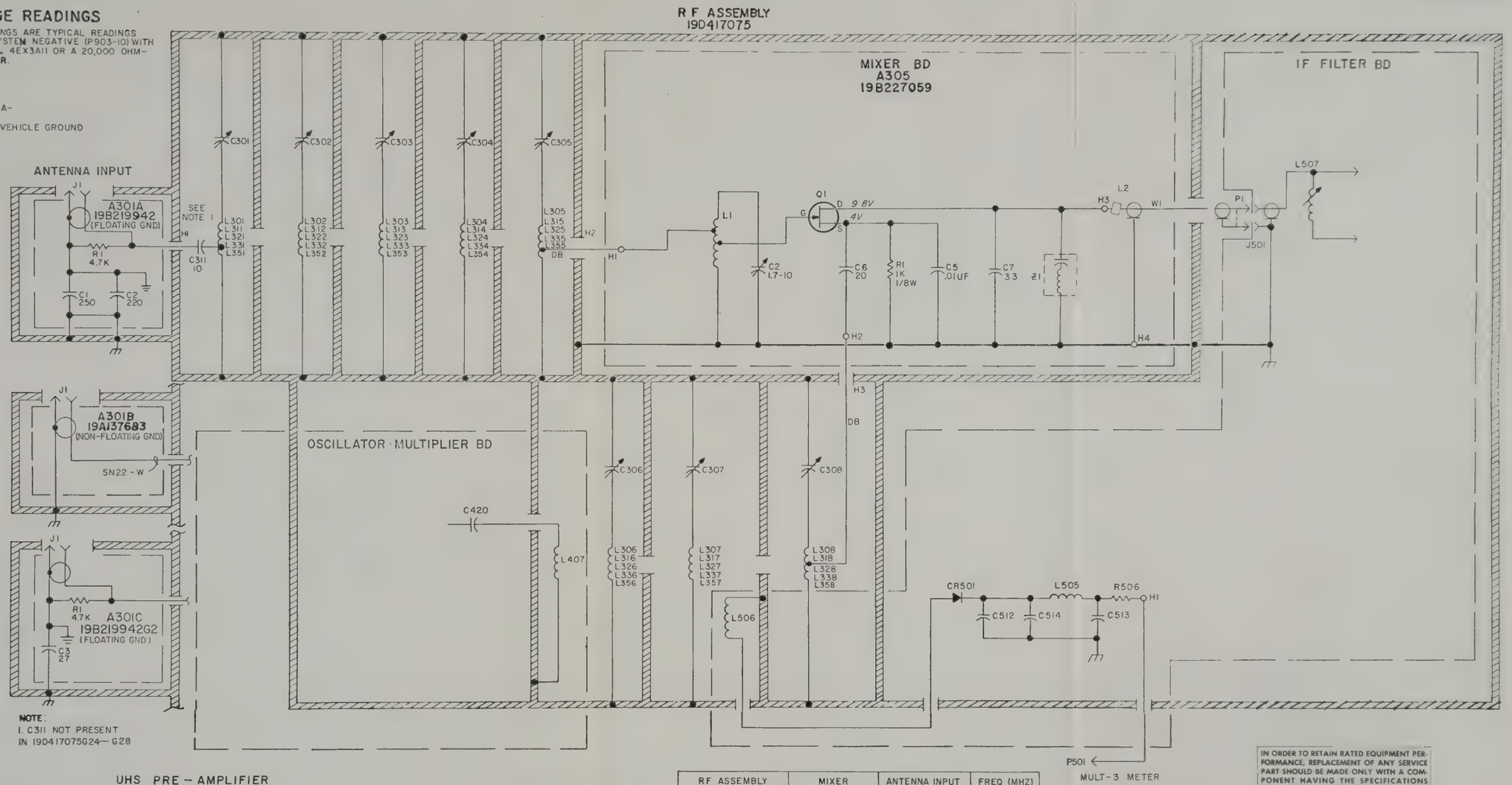
406—512 MHz, RF ASSEMBLY
19D417075G19-G28, IF-FILTER BOARD
19C331148G1-G2 AND MIXER BOARD
19B227059G3

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-101) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

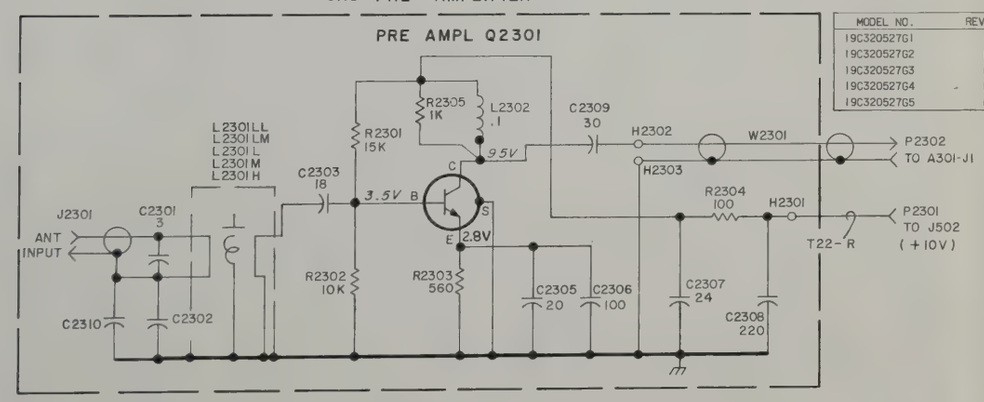
⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND



NOTE:
1. C311 NOT PRESENT IN 19D417075G24—G28

UHS PRE-AMPLIFIER



MODEL NO.	REV. LTR.
19C320527G1	B
19C320527G2	B
19C320527G3	B
19C320527G4	B
19C320527G5	B

(19B226008, Rev. 8)

RF ASSEMBLY	REV LTR	MIXER	REV LTR	ANTENNA INPUT	REV LTR	FREQ (MHZ)
19D417075G19	A	19B227059G3	–	19B219942G2	–	406-420(LL)
19D417075G20	A	19B227059G3	–	19B219942G1	–	420-450(LM)
19D417075G21	A	19B227059G3	–	19B219942G1	–	450-470 (L)
19D417075G22	A	19B227059G3	–	19B219942G1	–	470-494 (M)
19D417075G23	A	19B227059G3	–	19B219942G1	–	494-512 (H)
19D417075G24	A	19B227059G3	–	19A137683G2	–	406-420(LL)
19D417075G25	A	19B227059G3	–	19A137683G2	–	420-450 (LM)
19D417075G26	A	19B227059G3	–	19A137683G2	–	450-470(L)
19D417075G27	A	19B227059G3	–	19A137683G2	–	470-495(M)
19D417075G28	A	19B227059G3	–	19A137683G2	–	494-512(H)

COMPONENT VALUE TABLE					
COMP DESIG	LL	LM	L L	M	H
RF FREQ (MHZ)	406-420		450-470	470-494	494-512
L301-L308	X				
L311-L318			X		
L321-L328				X	
L331-L338					X
L351-L358		X			

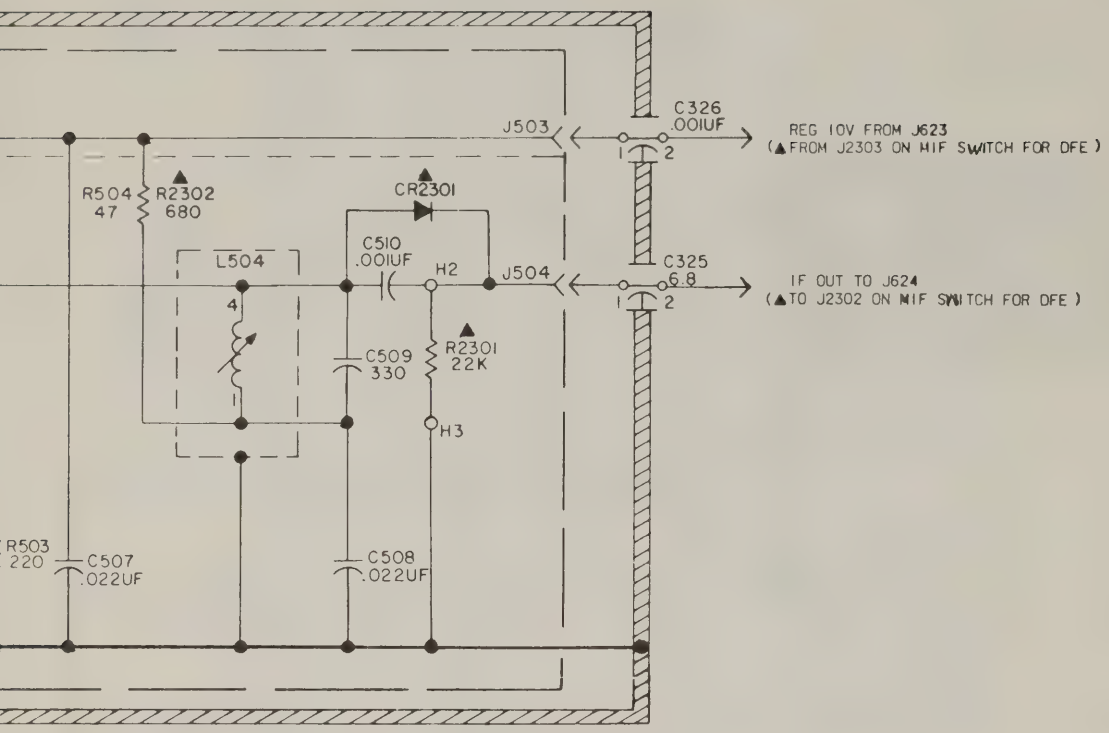
(19D432485, Rev. 2)

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS

SCHEMATIC DIAGRAM

406—512 MHz, RF ASSEMBLY
19D417075G19-G28
WITH MIXER BOARD 19B227059G3 AND
UHS PRE-AMPLIFIER 19C320527G1-G5



VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

A STANDARD MASTR II RECEIVER TO OPERATION SE COMPONENTS SHOULD BE BOARDS IDENTIFIED BY A RED DOT CN PER MOD KIT 19A129750G1 OR G2
D.F.E CHANNEL PL19C331148 CN PL19C320523 (IF FILTER BD)
NO MODIFICATION REQUIRED
SEE OSC/MULT BD FOR OTHER DFE CHANGES
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

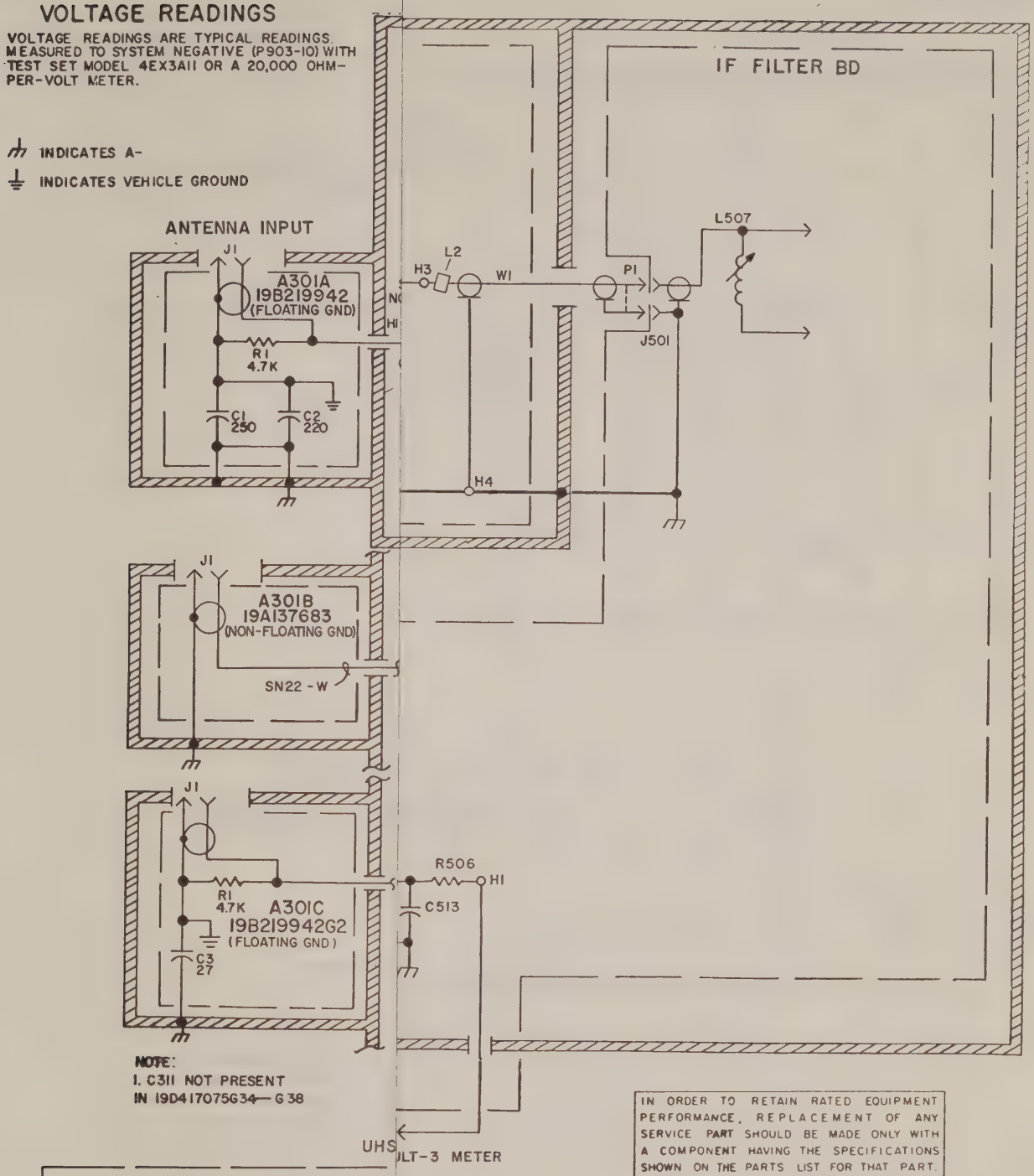
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS. MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND



NOTE:
1. C311 NOT PRESENT IN 19D417075G34—G38

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

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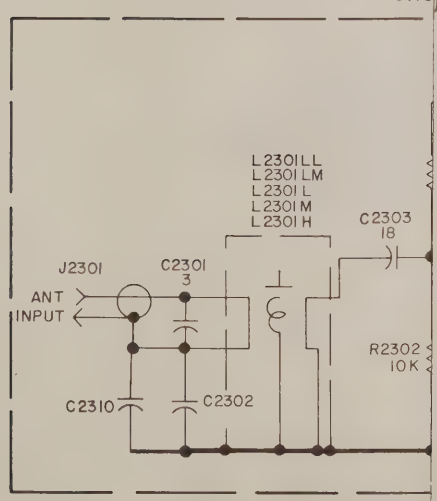
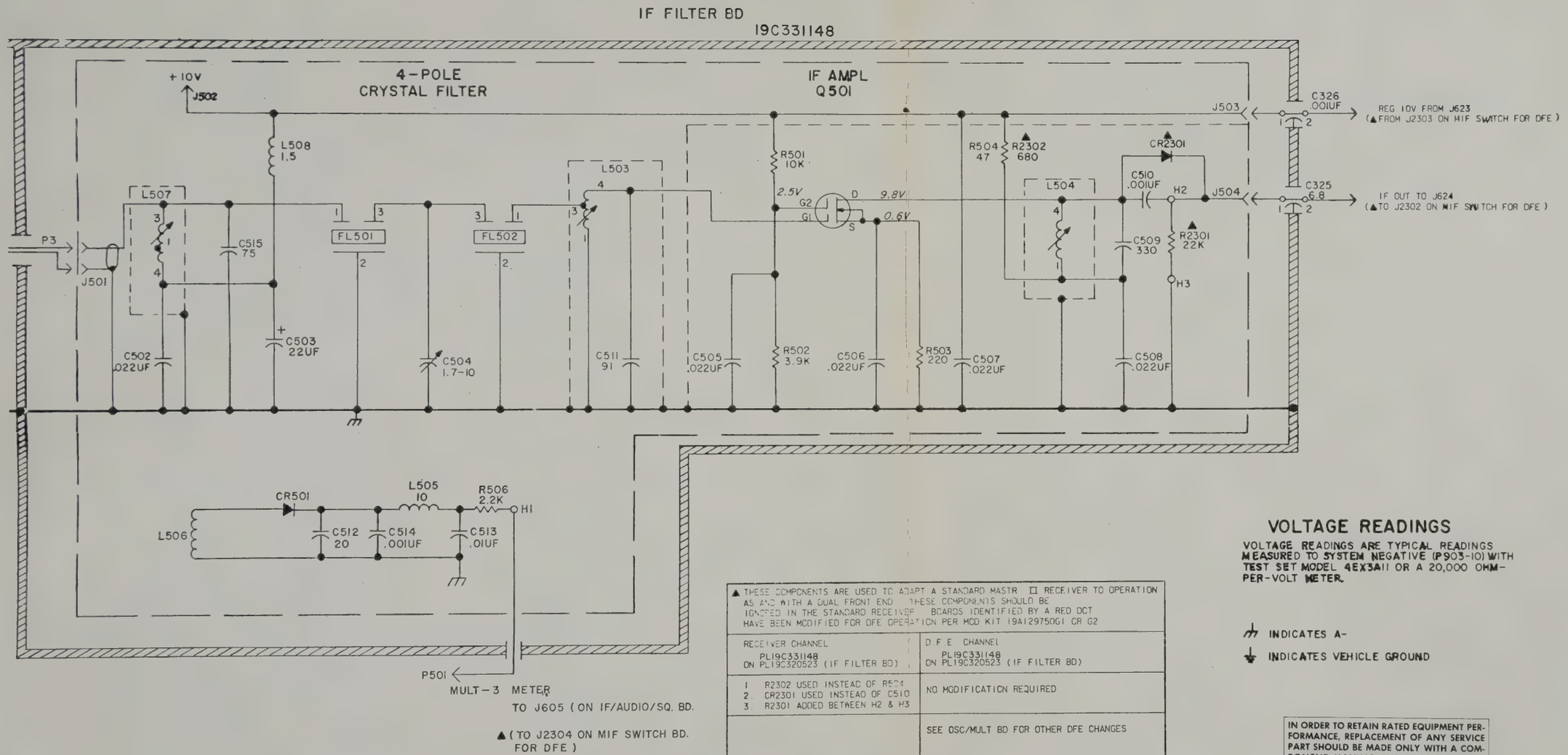


SCHEMATIC DIAGRAMS

406—512 MHz, RF ASSEMBLY
19D417075G29-G38
WITH MIXER BOARD 19B227059G4 AND
UHS PRE-AMPLIFIER 19C320527G1-G5



▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD MASTR II RECEIVER TO OPERATION AS AND WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2	
RECEIVER CHANNEL PL19C331148 ON PL19C320523 (IF FILTER BD)	D.F.E. CHANNEL PL19C331148 ON PL19C320523 (IF FILTER BD)
1. R2302 USED INSTEAD OF R504 2. CR2301 USED INSTEAD OF C510 3. R2301 ADDED BETWEEN H2 & H3	NO MODIFICATION REQUIRED
	SEE OSC/MULT BD FOR OTHER DFE CHANGES
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G1	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

	REV LETTER
IF FILTER BD	
19C331148G1	A

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

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SCHEMATIC DIAGRAM

IF-FILTER BOARD 19C331148G1

(19D432484, Rev. 2)

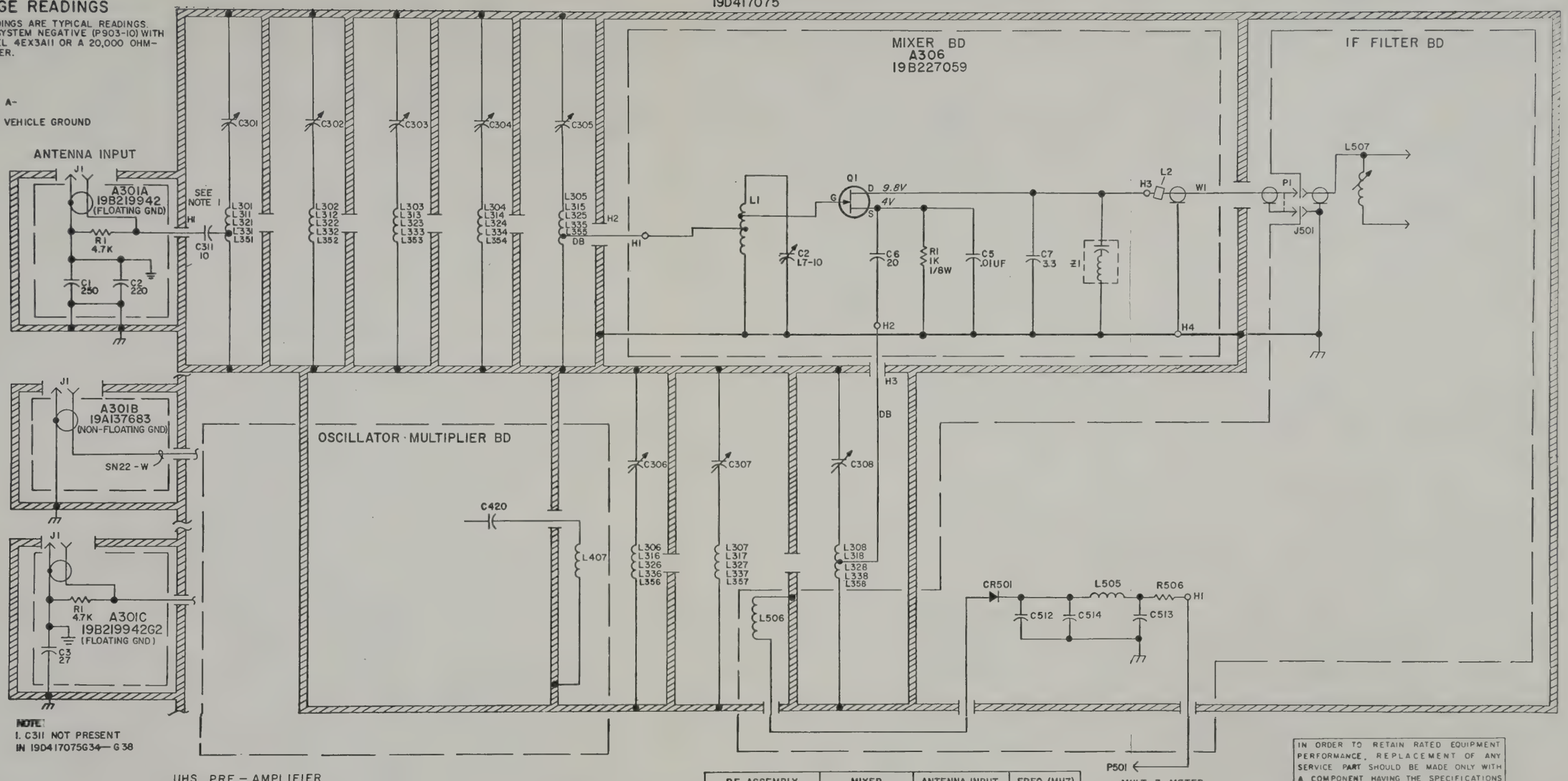
R F ASSEMBLY 19D417075

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS. MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

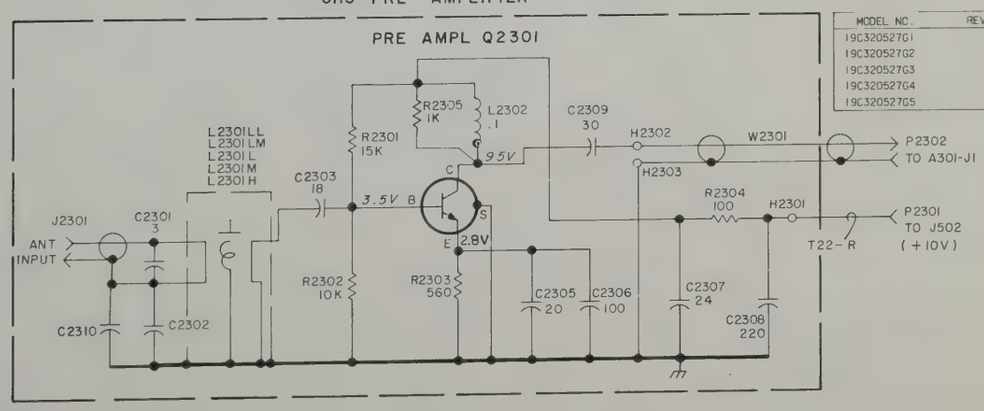
⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND



NOTE:
1. C311 NOT PRESENT IN 19D417075G34—G38

UHS PRE-AMPLIFIER



MODEL NO.	REV. LTR
19C320527G1	B
19C320527G2	B
19C320527G3	B
19C320527G4	B
19C320527G5	B

(19B226008, Rev. 8)

RF ASSEMBLY		MIXER		ANTENNA INPUT		FREQ (MHZ)
	REV LTR		REV LTR		REV LTR	
19D417075G29		19B227059G4	–	19B219942G2	–	406-420(LL)
19D417075G30		19B227059G4	–	19B219942G1	–	420-450(LM)
19D417075G31		19B227059G4	–	19B219942G1	–	450-470 (L)
19D417075G32		19B227059G4	–	19B219942G1	–	470-494 (M)
19D417075G33		19B227059G4	–	19B219942G1	–	494-512 (H)
19D417075G34		19B227059G4	–	19A137683G2	–	406-420 (LL)
19D417075G35		19B227059G4	–	19A137683G2	–	420-450 (LM)
19D417075G36		19B227059G4	–	19A137683G2	–	450-470(L)
19D417075G37		19B227059G4	–	19A137683G2	–	470-495(M)
19D417075G38		19B227059G4	–	19A137683G2	–	494-512(H)

COMPONENT VALUE TABLE					
COMP DESIG	LL	LM	LL	M	H
RF FREQ (MHZ)	406-420		450-470	470-494	494-512
L301-L308	X				
L311-L318			X		
L321-L328				X	
L331-L338					X
L351-L358		X			

(19D433368, Rev. 0)

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART

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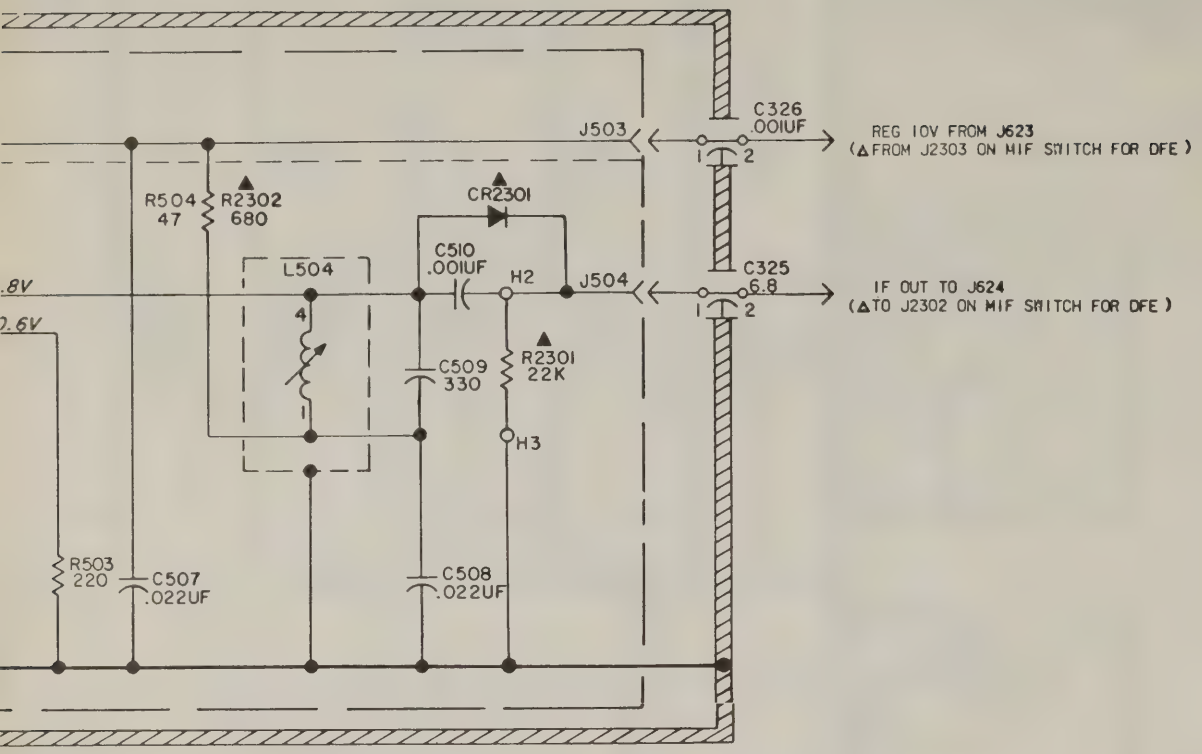
SCHEMATIC DIAGRAMS

406—512 MHz, RF ASSEMBLY 19D417075G29-G38
WITH MIXER BOARD 19B227059G4 AND
UHS PRE-AMPLIFIER 19C320527G1-G5



VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

TO ADAPT A STANDARD MASTR II RECEIVER TO OPERATION ND. THESE COMPONENTS SHOULD BE CEIVER. BOARDS IDENTIFIED BY A RED DOT OPERATION PER MOD KIT 19A129750G1 OR G2	
BD)	D.F.E. CHANNEL. PL19C331148 ON PL19C320523 (IF FILTER BD)
R504 C510 & H3.	NO MODIFICATION REQUIRED
	SEE OSC/MULT BD FOR OTHER DFE CHANGES
IN	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

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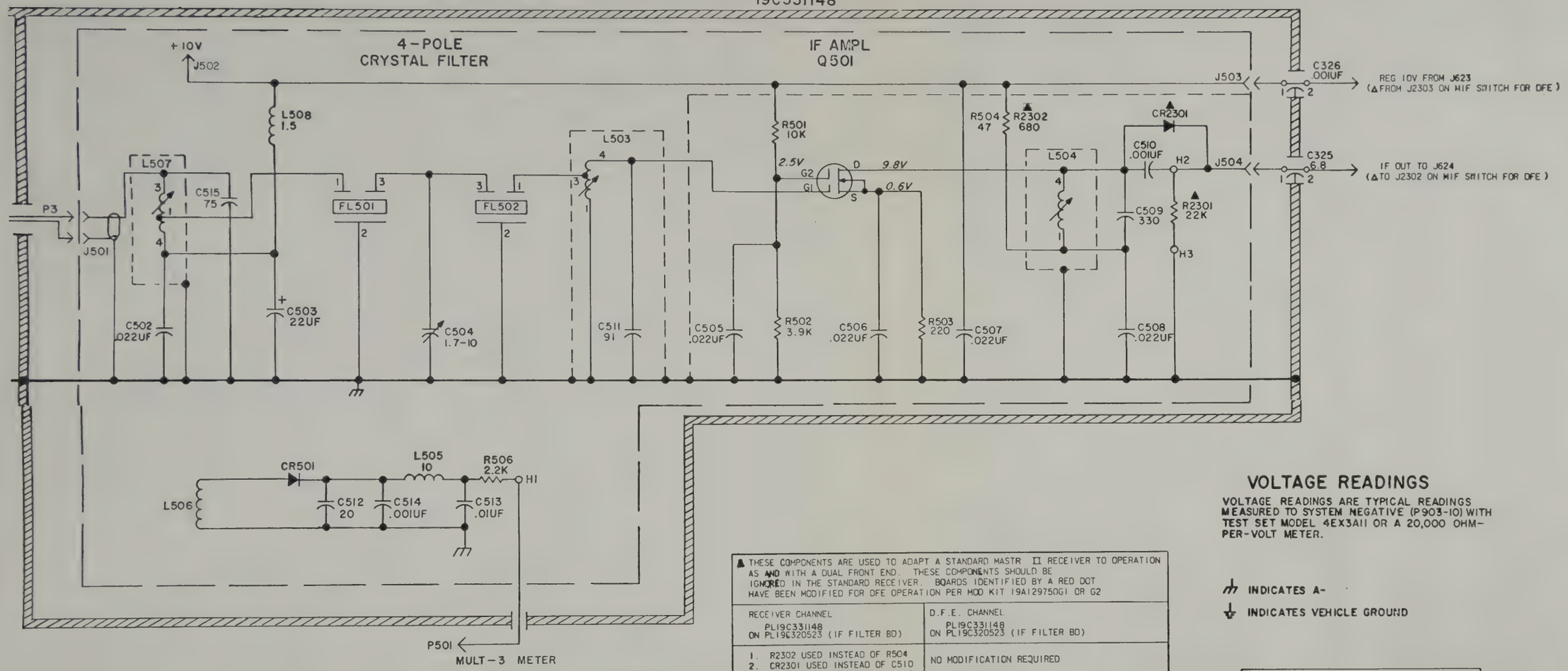
SYMBOL	RT NO.	DESCRIPTION
		- - - - - - - - - - - CABLES - - - - - - - - - - -
	P114	RF: approx. 5-1/8 inches long. (Includes P1).
		- - - - - - - - - - - NETWORKS - - - - - - - - - -
	66P1	Frequency network: selective, 470-630 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC.
		- - - - - - - - - - - CAPACITORS - - - - - - - - - -
		Includes:
	55P3	Screw.
	76G2	Nut: thd. size No. 6-32.
		Includes:
	55P2	Screw.
	76G2	Nut: thd. size No. 6-32.
	P241	Ceramic disc: 10 pF ±5%, 500 VDCW, temp coef -80 PPM. Deleted by G13-G16 by REV A.
A301A* and A301C*	38P1	Ceramic: 6.8 pF ±20%, 500 VDCW; sim to Allen Bradley Style FA5D.
	38P2	Ceramic: 1000 pF -10+100%, 500 VDCW; sim Allen Bradley Style FA5D.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - -
	38G37	Coil.
C1	7 14P1	Coil.
C2	1	
C3	1 38G33	Coil.
	14P5	Coil.
J1	7 38G41	Coil.
	38G38	Coil.
	14P2	Coil.
R1	1	
A301B*	38G34	Coil.
	14P6	Coil.
	38G42	Coil.
J1	7 38G39	Coil.
A301B*	14P3	Coil.
	38G35	Coil.
	14P7	Coil.
J1	7	
	38G43	Coil.
	38G40	Coil.
R1	1 14P4	Coil.
A303*		
	38G36	Coil.
	14P8	Coil.
C1	1	
C2	1 38G44	Coil.
	38G47	Coil.
C3	1 14P9	Coil.
C4*	1	
	38G48	Coil.
	14P10	Coil.
	1	
	38G49	Coil.

*COMPONENT

IF FILTER BD
19C331148



▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD MASTR II RECEIVER TO OPERATION AS AND WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2	
RECEIVER CHANNEL PLI9C331148 ON PLI9C320523 (IF FILTER BD)	D.F.E. CHANNEL PLI9C331148 ON PLI9C320523 (IF FILTER BD)
1. R2302 USED INSTEAD OF R504 2. CR2301 USED INSTEAD OF C510 3. R2301 ADDED BETWEEN H2 & H3.	NO MODIFICATION REQUIRED
	SEE OSC/MULT BD FOR OTHER DFE CHANGES
THESE ITEMS ARE SUPPLIED IN MOD. KIT PLI9A129750G1.	THESE ITEMS ARE SUPPLIED IN MOD. KIT PLI9A129750G2.

	REV LETTER
IF FILTER BD	
19C331148G2	

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

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ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

(19D433378, Rev. 0)

SCHEMATIC DIAGRAM

IF-FILTER BOARD 19C331148G2

PARTS LIST

LBI30033J

406-512 MHz RECEIVER RF ASSEMBLY
IF-FILTER BOARD ASSEMBLY
AND UHS PRE-AMPLIFIER

SYMBOL	GE PART NO.	DESCRIPTION
		RF ASSEMBLY 19D417075G9 406-420 MHz FLOATING GRD 19D417075G10 450-470 MHz FLOATING GRD 19D417075G11 470-494 MHz FLOATING GRD 19D417075G12 494-512 MHz FLOATING GRD 19D417075G13 406-420 MHz NON FLOATING GRD 19D417075G14 450-470 MHz NON FLOATING GRD 19D417075G15 470-494 MHz NON FLOATING GRD 19D417075G16 494-512 MHz NON FLOATING GRD 19D417075G17 420-450 MHz NON FLOATING GRD 19D417075G18 420-450 MHz FLOATING GRD 19D417075G19 406-420 MHz FLOATING GRD - REV. A 19D417075G20 450-470 MHz FLOATING GRD - REV. A 19D417075G21 470-494 MHz FLOATING GRD - REV. A
A301A* and A301C*		ANTENNA INPUT BOARD A301A 19B219942G1 450-512 MHz (Deleted in G9 by REV D). A301C 19B219942G2 406-420 MHz (Added to G9 by REV D).
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7484398P3	Silver mica: 250 pF ±10%, 500 VDCW; sim to Underwood Type 71HF.
C2	19A116679P220K	Silver Mica: 220 pF ±10%, 250 VDCW.
C3	19A116656P27J0	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	7104941P16	Jack, phono: coaxial; sim to National Tel Barrel Ceramic.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
A301B*		ANTENNA INPUT PLATE 19A137683G2 (Added to G13-G16 by REV. A)
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	7104941P20	Jack, phono: coaxial.
A301B*		ANTENNA INPUT PLATE 19A137683G1 (Deleted in G13-G16 by REV A)
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	7104941P20	Jack, phono: coaxial.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
A303*		MIXER BOARD 19B227059G1 (Deleted by REV. B)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P103	Polyester: 0.022 uF ±10%, 50 VDCW.
C2	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C3	19A116656P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM.
C4*	19A700219P14	Ceramic: 3.3 pF ±5%, 100 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	19A116656P3K0	Ceramic disc: 3 pF ±10%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		Part of Printed Wiring Board 19D423518P1.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		Part of W1.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect; sim to Type 2N4391.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102K	Composition: 1K ohms ±10%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P114	RF: approx. 5-1/8 inches long.
A304*		MIXER BOARD 19B227059G2 (Added by REV. B)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C4*	19A700219P14	Ceramic: 3.3 pF ±5%, 100 VDCW, temp coef 0 PPM. Deleted in G9-G12 by REV C, in G13-G16 by REV A.
C5	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C6	19A700219P39	Ceramic: 20 pF ±5%, 100 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		Part of Printed Board 19D429194P1.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		Part of W1.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect; sim to Type 2N4391.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P114	RF: approx. 5-1/8 inches long. (Includes P1).
A305		MIXER BOARD 19B227059G3
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C5	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C6	19A700219P39	Ceramic: 20 pF ±5%, 100 VDCW, temp coef 0 PPM.
C7	19A700219P14	Ceramic: 3.3 pF ±5%, 100 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		Part of Printed Board 19D429194P1.
L2	19A700122P1	Torridal core.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		Part of W1.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect; sim to Type 2N4391.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P114	RF: approx. 5-1/8 inches long. (Includes P1).
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z1	19A134666P1	Frequency network: selective, 470-630 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C301 thru C305	19C328755P3	Includes: Screw.
	19A143476G2	Nut: thd. size No. 6-32.
C306 thru C308	19C328755P2	Includes: Screw.
	19A143476G2	Nut: thd. size No. 6-32.
C311*	5496218P241	Ceramic disc: 10 pF ±5%, 500 VDCW, temp coef -80 PPM. Deleted by G13-G16 by REV A.
C325	19B209488P1	Ceramic: 6.8 pF ±20%, 500 VDCW; sim to Allen Bradley Style FA5D.
C326	19B209488P2	Ceramic: 1000 pF -10+100%, 500 VDCW; sim Allen Bradley Style FA5D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301	19B204938G37	Coil.
L302 thru L304	19B219944P1	Coil.
L305	19B204938G33	Coil.
L306 and L307	19B219944P5	Coil.
L308	19B204938G41	Coil.
L311	19B204938G38	Coil.
L312 thru L314	19B219944P2	Coil.
L315	19B204938G34	Coil.
L316 and L317	19B219944P6	Coil.
L318	19B204938G42	Coil.
L321	19B204938G39	Coil.
L322 thru L324	19B219944P3	Coil.
L325	19B204938G35	Coil.
L326 and L327	19B219944P7	Coil.
L328	19B204938G43	Coil.
L331	19B204938G40	Coil.
L332 thru L334	19B219944P4	Coil.
L335	19B204938G36	Coil.
L336 and L337	19B219944P8	Coil.
L338	19B204938G44	Coil.
L351	19B204938G47	Coil.
L352 thru L354	19B219944P9	Coil.
L355	19B204938G48	Coil.
L356 and L357	19B219944P10	Coil.
L358	19B204938G49	Coil.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2301	19A116859P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2301	19A700106P91	Composition: 15K ohms ±5%, 1/4 w.
R2302*	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
		In REV A & earlier:
	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R2303	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R2304	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R2305*	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
		In REV A:
	19A700106P61	Composition: 820 ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2301	5491689P94	RF: approx. 3 inches long. (Includes P2302).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19E501121G1	Casting, RF Circuit.
	19B227101G1	Cover, RF Circuit.
	19B209209P306	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/8. (Secures RF Circuit Cover).
	19C328755P3	Screw. (Part of C301-C305).
	19C328755P2	Screw. (Part of C306-C308).
	19A143476G2	Nut: thd. size No. 6-32. (Part of C301-C308).
	4031594P1	Insulator. (Used with C504 on IF Filter Board).
	19B219470P2	Shield. (Used with IF Filter Board).
	19A129424G1	Can. (Used with L401-L403, L501, L503, L504).
	19A127060P2	Can. (Used with L2301).
	4035306P59	Washer, fiber. (Used with FL501, FL502).
	4035306P23	Washer, fiber. (Used with J501, J2301).
	19A701332P1	Insulator disk. (Used with Q2301).
	4035306P11	Washer, fiber: 1/8 dia. (Used with Q501).
	4035306P23	Washer, fiber. (Used with J501).

SYMBOL	PART NO.	DESCRIPTION
	38G36	Coil.
	44P8	Coil.
	38G44	Coil.
	38G47	Coil.
	44P9	Coil.
	38P48	Coil.
	44P10	Coil.
	38P49	Coil.
		IF FILTER BOARD 19C331148G1 19C331148G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
	34P9	Polyester: 0.022 uF ±10%, 50 VDCW.
	34P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
	12P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
	77P17	Polyester: 0.22 uF ±20%, 50 VDCW.
	P139	Silver mica: 330 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-15.
	33P7	Ceramic: 1000 pF ±20%, 50 VDCW.
A301A and A301C		(Part of L503).
	56P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM.
	34P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C1	7	
	33P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C2	1P24	Silver mica: 75 pF ±5%, 500 VDCW, sim to Electro Motive Type DM-15.
C3	1	
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
	7P1	Silicon, 100 mW continous dissapation.
J1	7	
		- - - - - - - - - - FILTERS - - - - - - - - - -
	3G3	Crystal: Resonator A - 11,200.000; Resonator B - 11,196.024 kHz.
R1	1	(Part of FL501).
A301B		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
	4G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
	1	Contact, electrical: sim to Bead Chain L93-4.
J1	71	
	5P1	Contact, electrical.
A305		
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
	1G4	Coil. Includes:
	9	Tuning slug.
C2	19	
	1G29	Coil. Includes:
C5	199	Tuning slug.
	4P25	Coil, RF: 10.0 uH ±10%, 3.70 ohms DC res max.
C6	19	(Part of Printed Board 19C331147P1).
C7	19	
	0G1	Coil.
	0P114	Coil, RF: 1.5 uH ±10%; sim to Jeffers 4412-7K.
L1		
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
L2	19	(Part of W501).

*COMPONENT

SYMBOL	GE PART NO.	DESCRIPTION
		IF FILTER BOARD 19C320523G2, G3
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C502	19A116080P103	Polyester: 0.022 uF ±10%, 50 VDCW.
C503	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C504	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C505 thru C508	19A116080P3	Polyester: 0.022 uF ±20%, 50 VDCW.
C509	5490008P139	Silver mica: 330 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-15.
C510	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C511		(Part of L503).
C512	19A116656P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM.
C513	19A116080P101	Polyester: 0.01 uF ±10%, 50 VDCW.
C514	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C515A	5490008P27	Silver mica: 100 pF ±5%, 500 VDCW, sim to Electro Motive Type DM-15.
C515B	5490008P24	Silver mica: 75 pF ±5%, 500 VDCW, sim to Electro Motive Type DM-15.
C516*	19A116656P3K0	Ceramic disc: 3 pF ±10%, 500 VDCW, temp coef 0 PPM. Added by REV A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR501	19A116052P1	Silicon, hot carrier: Fwd drop .350 volts max.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL501	19B219573G3	Crystal: Resonator A - 11,200.000; Resonator B - 11,196.024 kHz.
FL502		(Part of FL501).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J501	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J502	4033513P1	Contact, electrical: sim to Bead Chain L93-4.
J503 and J504	19A116975P1	Receptacle, wire spring.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L502*	7488079P48	Coil, RF: 27 uH 10%, 1.4 ohms DC res max; sim. to Jeffers 4422-9. Deleted by REV A.
L503	19C320141G4	Coil. Includes:
	5493185P9	Tuning slug.
L504	19C320141G29	Coil. Includes:
	5493185P9	Tuning slug.
L505	19A700024P25	Coil, RF: 10.0 uH ±10%, 3.70 ohms DC res max.
L506		(Part of Printed Board 19C320522P1).
L507	19C321810G1	Coil.
L508	19A700000P114	Coil, RF: 1.5 uH ±10%; sim to Jeffers 4412-7K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501		Part of W501.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q501	19A116818P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R502	19A700106P77	Composition: 3.9K ohms ±5%, 1/4 w.
R503	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R504	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R506	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501	19A129947G7	Cable: orange, No. 22 stranded, approx. 7-1/2 inches. (Includes P501).
		UHS RF PRE-AMPLIFIER 19C320527G1 406-420 MHz (LL) 19C320527G2 450-470 MHz (L) 19C320527G3 470-494 MHz (M) 19C320527G4 494-512 MHz (H) 19C320527G5 420-450 MHz (LM)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2301	19A116656P3J8	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp coef -80 PPM.
C2302*	19A116679P220K	Silver Mica: 220 pF ±10%, 250 VDCW. Deleted by REV A.
C2302A*	19A134666P2	Frequency network: selective, 460-600 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:270J:SLAC. Added by G1 & G5 by REV A.
C2302B*	19A134666P1	Frequency network: selective, 470-630 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added to G2-G4 by REV A.
C2303	19A116656P18J8	Ceramic disc: 18 pF ±5%, 500 VDCW, temp coef -80 PPM.
C2305	19A116656P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM.
C2306*	5490008P127	Silver mica: 100 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-15.
		Earlier than REV A:
	19A116679P100K	Silver Mica: 100 pF ±10%, 250 VDCW.
C2307*	19A116656P24J0	Ceramic disc: 24 pF ±5%, 500 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	19A116679P220K	Silver Mica: 220 pF ±10%, 250 VDCW.
C2308*	5490008P135	Silver mica: 220 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-15.
		Earlier than REV A:
	19A116679P100K	Silver Mica: 100 pF ±10%, 250 VDCW.
C2309	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp coef -80 PPM.
C2310*	19A116656P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM. Deleted by REV A.
C2310A*	19A134666P2	Frequency network: selective, 460-700 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:270J:SLAC. Added by REV B.
C2310B*	19A134666P1	Frequency network: selective, 470-630 MHz res freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV B.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J2301	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2301LL	19D413078G3	Helical resonator.
L2301L	19D413078G5	Helical resonator.
L2301M	19D413078G6	Helical resonator.
L2301H	19D413078G7	Helical resonator.
L2301LM	19D413078G9	Helical resonator.
L2302*	19B209420P101	Coil, RF: .10 uH ±10%, 0.8 ohms DC res max; sim to Jeffers 4416-1K.
		Earlier than REV A:
	19A129716G4	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2301	4029840P2	Contact, electrical: 24-18 wire Size, sim to Amp 42827-2.
P2302		(Part of W2301).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q2301	19A116859P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2301	19A700106P91	Composition: 15K ohms ±5%, 1/4 w.
R2302*	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
		In REV A & earlier:
	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R2303	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R2304	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R2305*	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
		In REV A:
	19A700106P61	Composition: 820 ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2301	5491689P94	RF: approx. 3 inches long. (Includes P2302).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19E501121G1	Casting, RF Circuit.
	19B227101G1	Cover, RF Circuit.
	19B209209P306	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/8. (Secures RF Circuit Cover).
	19C328755P3	Screw. (Part of C301-C305).
	19C328755P2	Screw. (Part of C306-C308).
	19A143476G2	Nut: thd. size No. 6-32. (Part of C301-C308).
	4031594P1	Insulator. (Used with C504 on IF Filter Board).
	19B219470P2	Shield. (Used with IF Filter Board).
	19A129424G1	Can. (Used with L401-L403, L501, L503, L504).
	19A127060P2	Can. (Used with L2301).
	4035306P59	Washer, fiber. (Used with FL501, FL502).
	4035306P23	Washer, fiber. (Used with J501, J2301).
	19A701332P1	Insulator disk. (Used with Q2301).
	4035306P11	Washer, fiber: 1/8 dia. (Used with Q501).
	4035306P23	Washer, fiber. (Used with J501).

PARTS LIST

RF ASSEMBLY
19B233690G1-G20
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		STANDARD 19B233690G1, 11 406-420 MHz 19B233690G2, 12 420-450 MHz 19B233690G3, 13 450-470 MHz 19B233690G4, 14 470-494 MHz 19B233690G5, 15 494-512 MHz
		NON FLOATING GROUND ONLY 19B233690G6, 16 406-420 MHz 19B233690G7, 17 420-450 MHz 19B233690G8, 18 450-470 MHz 19B233690G9, 19 470-494 MHz 19B233690G10, 20 494-512 MHz
		RF CIRCUIT 19D417075G19, 29 406-420 MHz FLOATING GRD 19D417075G20, 30 420-450 MHz FLOATING GRD 19D417075G21, 31 450-470 MHz FLOATING GRD 19D417075G22, 32 470-494 MHz FLOATING GRD 19D417075G23, 33 494-512 MHz FLOATING GRD 19D417075G24, 34 406-420 MHz NON FLOATING GRD 19D417075G25, 35 420-450 MHz NON FLOATING GRD 19D417075G26, 36 450-470 MHz NON FLOATING GRD 19D417075G27, 37 470-494 MHz NON FLOATING GRD 19D417075G28, 38 494-512 MHz NON FLOATING GRD
A301A and A301C		COMPONENT BOARD A301A 19B219942G1 A301C 19B219942G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7484398P3	Silver mica: 250 pF ±10%, 500 VDCW; sim to Underwood Type 71HF.
C2	19A116679P220K	Silver Mica: 220 pF ±10%, 250 VDCW.
C3	19A116656P27J0	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	7104941P16	Jack, phono: coaxial.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
A301B		ANTENNA INPUT PLATE 19A137683G2
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	7104941P20	Jack, phono: coaxial.
A305		MIXER BOARD 19B227059G3, G4
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C5	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C6	19A700219P39	Ceramic: 20 pF ±5%, 100 VDCW, temp coef 0 PPM.
C7	19A700219P14	Ceramic: 3.3 pF ±5%, 100 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of Printed Board 19D429194P1).
L2	19A700122P1	Torridal core.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		(Part of W1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect; sim to Type 2N4391. (Used in G3).
Q1	19A700060P2	N Type, field effect. (Used in G4).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	4391689P114	Cable, RF: approx 5-1/2 inches long. (Includes P1).
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z1	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C301 thru C305	19C328755P3	Includes: Screw.
	19A143476G2	Nut: thd. size No. 6-32.
C306 thru C308	19C328755P2	Includes: Screw.
	19A143476G2	Nut: thd. size No. 6-32.
C311	5496218P241	Ceramic disc: 10 pF ±5%, 500 VDCW, temp coef -80 PPM.
C325	19B209488P1	Ceramic: 6.8 pF ±20%, 500 VDCW; sim to Allen Bradley Style FA5D.
C326	19B209488P2	Ceramic: 1000 pF -10+100%, 500 VDCW; sim Allen Bradley Style FA5D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301	19B204938G37	Coil.
L302 thru L304	19B219944P1	Coil.
L305	19B204938G33	Coil.
L306 and L307	19B219944P5	Coil.
L308	19B204938G41	Coil.
L311	19B204938G38	Coil.
L312 thru L314	19B219944P2	Coil.
L315	19B204938G34	Coil.
L316 and L317	19B219944P6	Coil.
L318	19B204938G42	Coil.
L321	19B204938G39	Coil.
L322 thru L324	19B219944P3	Coil.
L325	19B204938G35	Coil.
L326 and L327	19B219944P7	Coil.
L328	19B204938G43	Coil.
L331	19B204938G40	Coil.
L332 thru L334	19B219944P4	Coil.
L335	19B204938G36	Coil.
L336 and L337	19B219944P8	Coil.
L338	19B204938G44	Coil.
L351	19B204938G47	Coil.
L352 thru L354	19B219944P9	Coil.
L355	19B204938P48	Coil.
L356 and L357	19B219944P10	Coil.
L358	19B204938P49	Coil.
		IF FILTER BOARD 19C331148G1 19C331148G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C502	19A700234P9	Polyester: 0.022 uF ±10%, 50 VDCW.
C503	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C504	19A700012P1	Variable, ceramic: 2 to 10 pF, 200 VDCW, temp coef -350+500 PPM; sim to Panasonic ECV-1ZW10X32.
C505 thru C508	19A143477P17	Polyester: 0.22 uF ±20%, 50 VDCW.
C509	5490008P139	Silver mica: 330 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-15.
C510	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C511		(Part of L503).
C512	19A116656P20K0	Ceramic disc: 20 pF ±10%, 500 VDCW, temp coef 0 PPM.
C513	19A700234P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C514	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C515	5490008P24	Silver mica: 75 pF ±5%, 500 VDCW, sim to Electro Motive Type DM-15.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR501	19A700047P1	Silicon, 100 mW continous dissapation.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL501	19B219573G3	Crystal: Resonator A - 11,200.000; Resonator B - 11,196.024 kHz.
FL502		(Part of FL501).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J501	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J502	4033513P1	Contact, electrical: sim to Bead Chain L93-4.
J503 and J504	19A116975P1	Contact, electrical.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L503	19C320141G4	Coil. Includes:
	5493185P9	Tuning slug.
L504	19C320141G29	Coil. Includes:
	5493185P9	Tuning slug.
L505	19A700024P25	Coil, RF: 10.0 uH ±10%, 3.70 ohms DC res max.
L506		(Part of Printed Board 19C331147P1).
L507	19C321810G1	Coil.
L508	19A700000P114	Coil, RF: 1.5 uH ±10%; sim to Jeffers 4412-7K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501		(Part of W501).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

ts

simplify circuits
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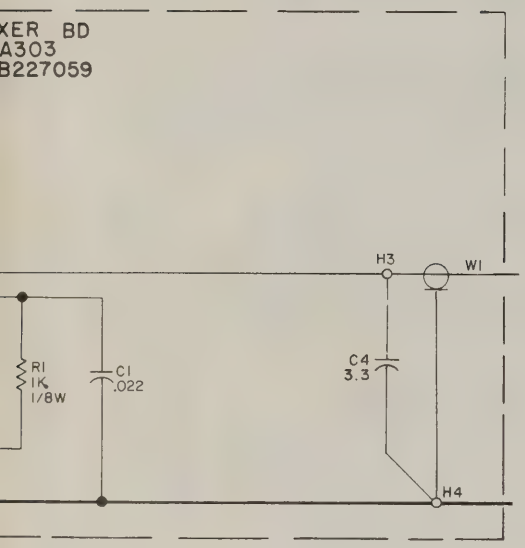
includes all previous
of parts affected by

.

03 (19B227059G1)



REV. A - RF Assembly 19D417075G19-G28
IF Filter Board 19C331148G1
To improve operation of UHF mixer circuit. Added C7 and L2.

REV. B - UHS Pre-Amplifier
To improve receiver sensitivity. Changed R2302 and R2305. Added C2310.

8, added C516.

MHz range.

02, C2302,
ded R2305.

02 and R2305.

MAINTENANCE MANUAL

406—512 MHz OSCILLATOR/MULTIPLIER BOARD 19D423266G1-G10

TABLE OF CONTENTS

DESCRIPTION	1
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DESCRIPTION

The MASTR® II oscillator-multiplier (Osc/Mult) can be equipped with up to eight Integrated Circuit Oscillator Modules (ICOMS). The ICOM crystal frequencies range from approximately 14.5 to 18.5 megahertz, and the crystal frequency is multiplied 27 times and then amplified to provide a low side in injection frequency to the mixer. Optional ICOMs are available for high side injection.

In receivers equipped with a Dual Front End (DFE), a second Osc/Mult board is used. A total of eight ICOMs can be used between the two Osc/Mult boards.

CIRCUIT ANALYSIS

ICOMs

Three different types of ICOMs are available for use in the Osc/Mult module. Each contains a crystal-controlled Colpitts oscillator, and two of the ICOMs contain compensator ICs. The different ICOMs are:

- 5C-ICOM - contains an oscillator and a 5 part-per-million (±0.0005%) compensator IC. Provides compensation for EC-ICOMs.
- EC-ICOM - contains an oscillator only. Requires external compensation from a 5C-ICOM.
- 2C ICOM - contains an oscillator and a 2 PPM (±0.0002%) compensator IC. Will not provide compensation for an EC-ICOM.

The ICOMs are enclosed in an RF shielded can with the type ICOM (5C-ICOM, EC-ICOM or 2C-ICOM) printed on the top of the can. Access to the oscillator trimmer is obtained through a hole on top of the can.

Frequency selection is accomplished by switching the ICOM keying lead (terminal 6) to A- by using the frequency selector switch on the control unit. In single frequency radios, a jumper from H9 to H10 in the control unit connects terminal 6 of the ICOM to A-.

In DFE applications, keying leads of the receiver and the DFE Osc/Mult ICOMs are operated in parallel. Therefore, ICOMs in the receiver can not be placed in the same position as those in the DFE.

In the receive mode, +10 Volts is applied to the external ICOM load resistor (R401) by the RX Osc control line, keeping the selected ICOM turned on. Keying the transmitter removes the 10 Volts at R401, turning the ICOM off.

CAUTION

All ICOMs are individually compensated at the factory and cannot be repaired in the field. Any attempt to repair or change an ICOM frequency will void the warranty.

In standard 5 PPM radios using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs in the transmitter and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (+5 Volts) from the 10-Volt regulator IC. If desired, up to 16 5C-ICOMs may be used in the radio.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q501	19A116818P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R502	19A700106P77	Composition: 3.9K ohms ±5%, 1/4 w.
R503	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R504	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R506	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501	19A129947G7	Cable: orange, No. 22 stranded, approx. 7-1/2 inches. (Includes P501).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19E501121G1	Casting, RF Circuit.
	19B227101G1	Cover, RF Circuit.
	19B209209P306	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/8. (Secures RF Circuit Cover).
	19C328755P3	Screw. (Part of C301-C305).
	19C328755P2	Screw. (Part of C306-C308).
	19A143476G2	Nut: thd. size No. 6-32. (Part of C301-C308).
	4031594P1	Insulator. (Used with C504 on IF Filter Board).
	19B219470P2	Shield. (Used with IF Filter Board).
	19A129424G1	Can. (Used with L503, L504, L507).
	4035306P59	Washer, fiber. (Used with FL501, FL502).
	4035306P23	Washer, fiber. (Used with J501).
	4035306P11	Washer, fiber: 1/8 dia. (Used with Q501).
	19A129715G1	Adapter Board.

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after all the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - RF Assembly 19D417075G9-12

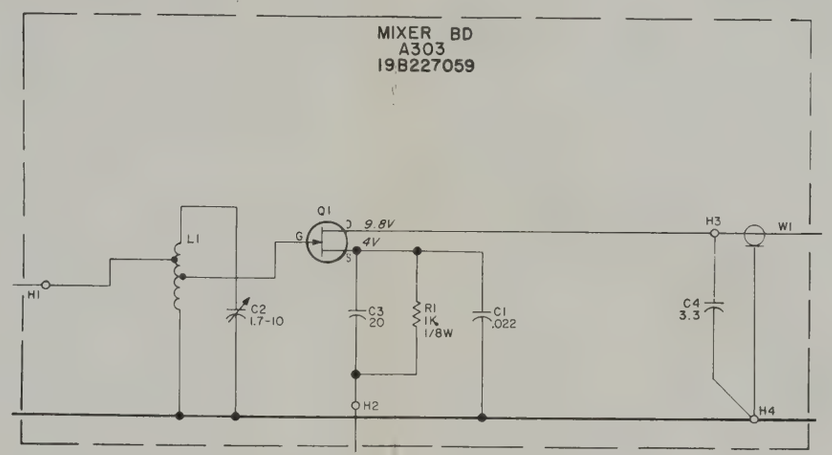
To improve receiver sensitivity. Changed C4.

REV. B - RF Assembly 19D417075G9-12

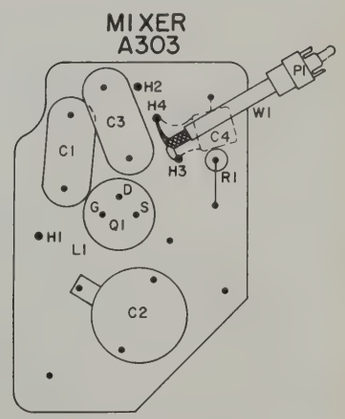
To incorporate new mixer board. Replaced A303 (19B227059G1) with A304 (19B227059G2).

Schematic Diagram Was:

R F ASSEMBLY
19D417075



Outline Diagram Was:



REV. A - IF-Filter Board 19C320523G2

To improve operation. Replaced L502 with L508, added C516.

REV. A - RF Assembly 19D417075G13-G16

REV. C - RF Assembly 19D417075G9-G12

To improve sensitivity. Deleted A304-C4.

REV. D - RF Assembly 19D417075G9

To improve receiver sensitivity in 406 to 420 MHz range. Added A301C.

REV. A - UHS Pre-Amplifier

To incorporate new coil (L2302). Changed L2302, C2302, C2306, C2307 and C2308. Deleted C2310 and added R2305.

REV. B - UHS Pre-Amplifier

To improve receiver sensitivity. Changed R2302 and R2305. Added C2310.

REV. A - RF Assembly 19D417075G19-G28
IF Filter Board 19C331148G1

To improve operation of UHF mixer circuit. Added C7 and L2.

REV. B - UHS Pre-Amplifier

To improve receiver sensitivity. Changed R2302 and R2305. Added C2310.

MOBILE RADIO

MAINTENANCE MANUAL

406—512 MHz OSCILLATOR/MULTIPLIER BOARD 19D423266G1-G10

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DESCRIPTION

The MASTR® II oscillator-multiplier (Osc/Mult) can be equipped with up to eight Integrated Circuit Oscillator Modules (ICOMS). The ICOM crystal frequencies range from approximately 14.5 to 18.5 megahertz, and the crystal frequency is multiplied 27 times and then amplified to provide a low side injection frequency to the mixer. Optional ICOMs are available for high side injection.

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ICOMs

Three different types of ICOMs are available for use in the Osc/Mult module. Each contains a crystal-controlled Colpitts oscillator, and two of the ICOMs contain compensator ICs. The different ICOMs are:

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CAUTION

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In standard 5 PPM radios using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs in the transmitter and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (+5 Volts) from the 10-Volt regulator IC. If desired, up to 16 5C-ICOMs may be used in the radio.

The 2C-ICOMs are self-compensated to 2 PPM and can not provide compensation for EC-ICOMs.

When a DFE is used with a wide spaced transmitter option, compensation voltage for the 5C-ICOMs is supplied from the EC-ICOM. Should the 5C-ICOM fail, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (32°F to 131°F) due to the regulated compensation voltage.

Oscillator Circuit

The quartz crystals used in ICOMs exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

At both the coldest and the hottest temperatures, the frequency increases with increasing temperature. In the middle temperature range (approximately 0°C to +55°C), frequency decreases with increasing temperature. In the middle temperature range (approximately 0°C to +55°C), frequency decreases with increasing temperature.

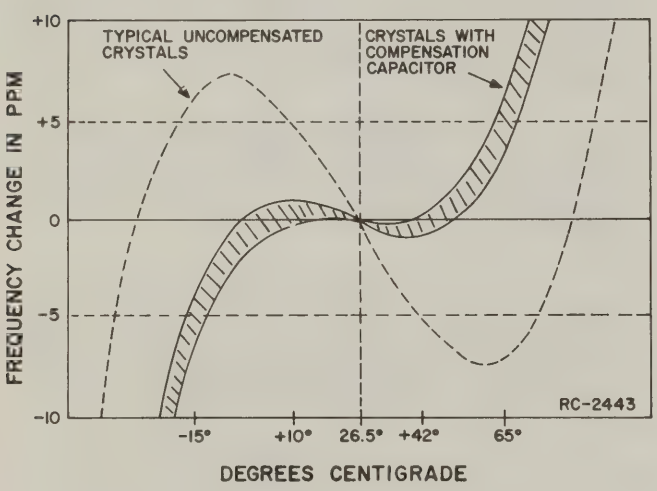

Figure 1 - Typical Crystal Characteristics

Since the rate of change is nearly linear over the mid-temperature range the output frequency change can be compensated by choosing a parallel compensation capacitor with a temperature coefficient approximately equal and opposite that of the crystal.

Figure 1 shows the typical performance of an uncompensated crystal as well as the typical performance of a crystal which has been matched with a properly chosen compensation capacitor.

At temperatures above and below the mid-range, additional compensation must be introduced. An externally generated compensation voltage is applied to a varactor (voltage-variable capacitor) which is parallel with the crystal.

A constant bias of 5 Volts (provided from Regulator IC U901 in parallel with the compensator) establishes the varactor capacity at a constant value over the entire mid-temperature range. With no additional compensation, all of the oscillators will provide 2 PPM frequency stability from 0°C to 55°C (+30°F to 131°F).

Compensator Circuits

Both the 5C-ICOMs and 2C-ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation. An equivalent ICOM circuit is shown in Figure 2.

The cold end compensation circuit does not operate at temperatures above 0°C. When the temperature drops below 0°C, the circuit is activated. As the temperature decreases, the equivalent resistance decreases and the compensation voltage increases.

The increase in compensation voltage decreases the capacity of the varactor in the oscillator, increasing the output frequency of the ICOM.

The hot end compensation circuit does not operate at temperatures below +55°C. When the temperature rises above +55°C, the circuit is activated. As the temperature increases, the equivalent resistance decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacity of the varactor, decreasing the output frequency of the ICOM.

Service Note: Proper ICOM operation is dependent on the closely-controlled input voltages from the 10-Volt regulator. Should all of the ICOMs shift off frequency, check the 10-Volt regulator module.

MULTIPLIERS & AMPLIFIER

The output of the selected ICOM is coupled through a tuned circuit (L401 and C406) that is tuned to three times the crystal frequency. The output of the tuned circuit is applied to the base of Class C multiplier Q401. The collector tank circuit of the multiplier (L402, C411 and C412) is tuned to nine times the crystal frequency. The output of the multiplier stage is metered through a metering network consisting of C427 and L405, and applied to receiver metering jack J601 through P903-14.

Following the multiplier is a Class A Amplifier stage, Q402. The output of Q402 is metered through a metering network consisting of C419, C420, CR402 and R408 and applied to receiver metering jack J601 through P903-15. The amplified output of Q402 is applied to a tuned circuit (L403, C416 and C417) that is tuned to nine times the crystal frequency. The tuned circuit provides some selectivity in the oscillator-multiplier chain.

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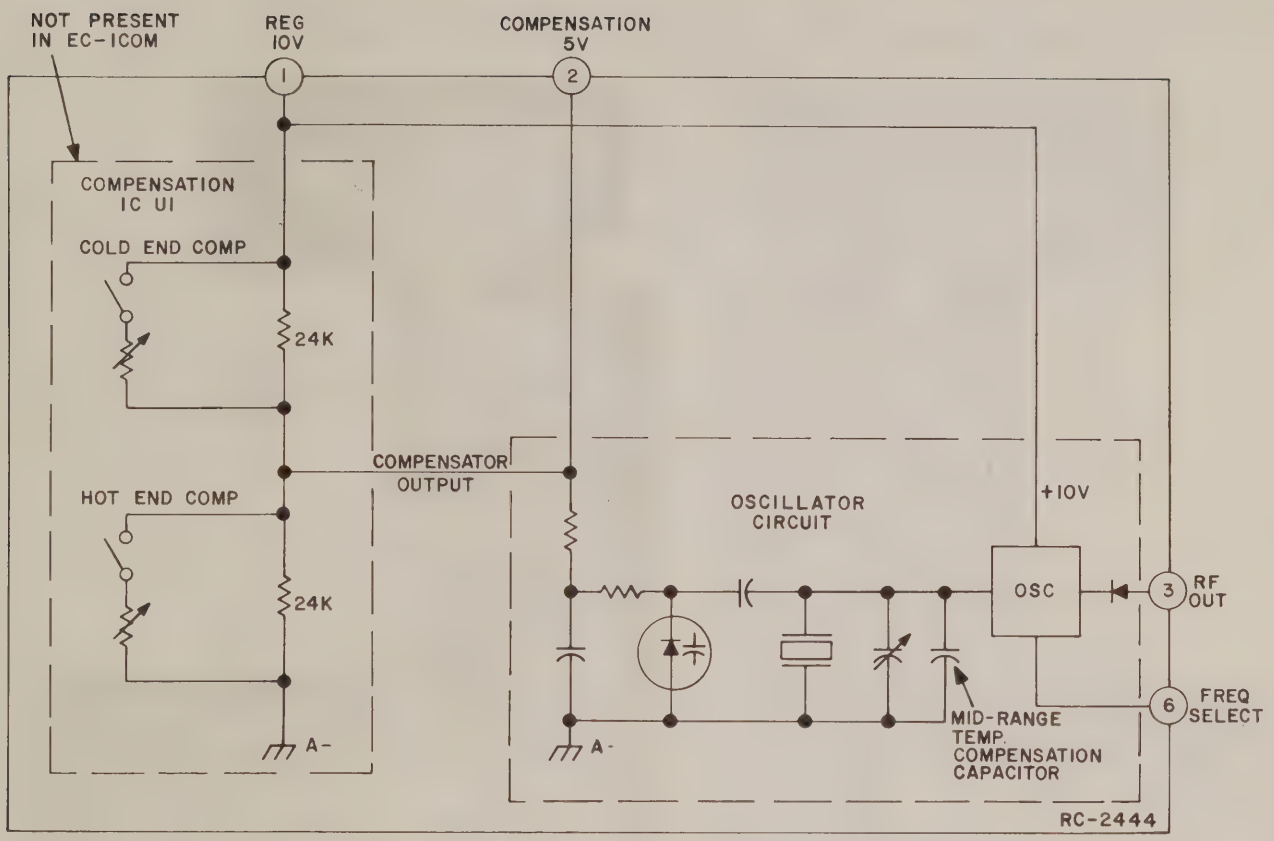

Figure 2 - Equivalent ICOM Circuit

The amplifier output is applied to the base of Class C multiplier Q403 through a matching network (T401 and C426). The output of Q403 is inductively coupled to the first of three helical resonators on the RF Assembly through L407. The helicals are tuned to 27 times the crystal frequency.

Most of the selectivity for the oscillator-multiplier chain is provided by the three high-Q helicals. The output of the helicals is applied to the input of the mixer stage on the RF Amplifier assembly.

The multiplier output is metered at J605-7 through a metering network on the IF-Filter board. The metering network consists of L505, L506, C512, C513, C514, CR501 and R506.

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WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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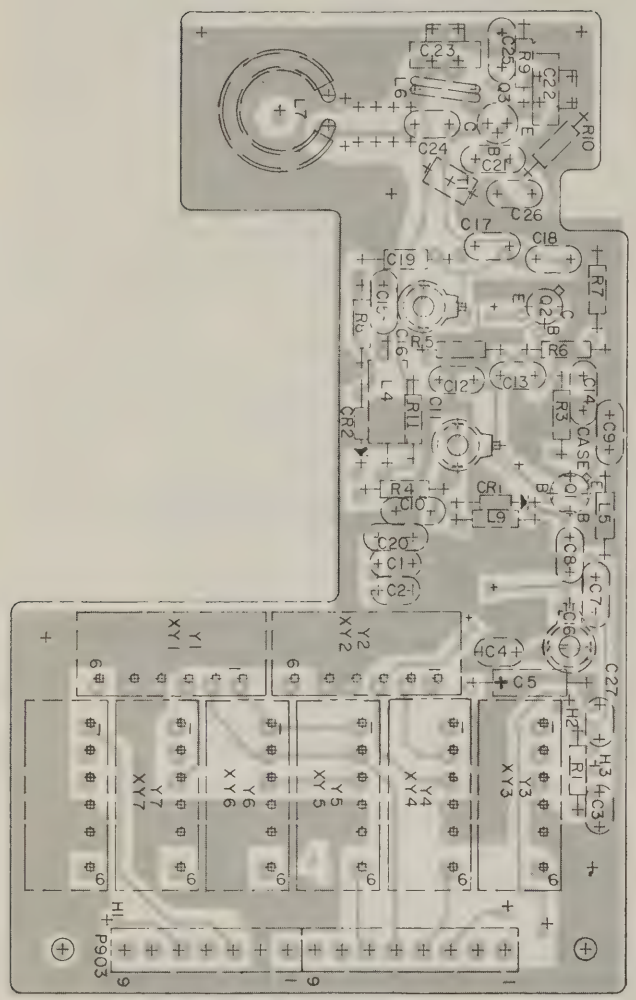
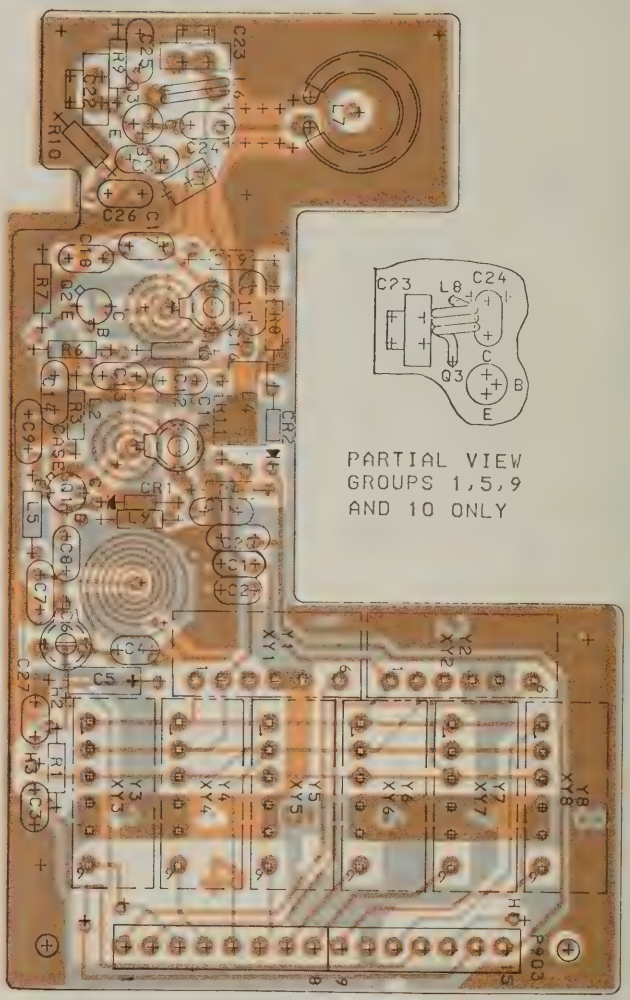
OSC/MULT BD

SOLDER SIDE



(19D423267, Sh. 2, Rev. 4)

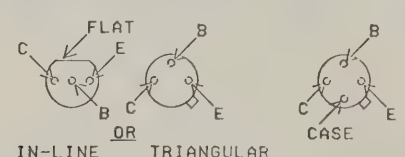
COMPONENT SIDE



(19D423267, Sh. 2, Rev. 4)
(19D423267, Sh. 3, Rev. 4)

LEAD IDENTIFICATION

FOR Q2 AND Q3 — FOR Q1



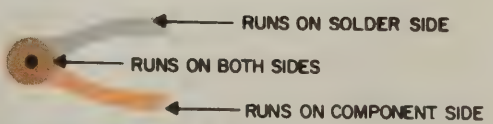
TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

NOTE

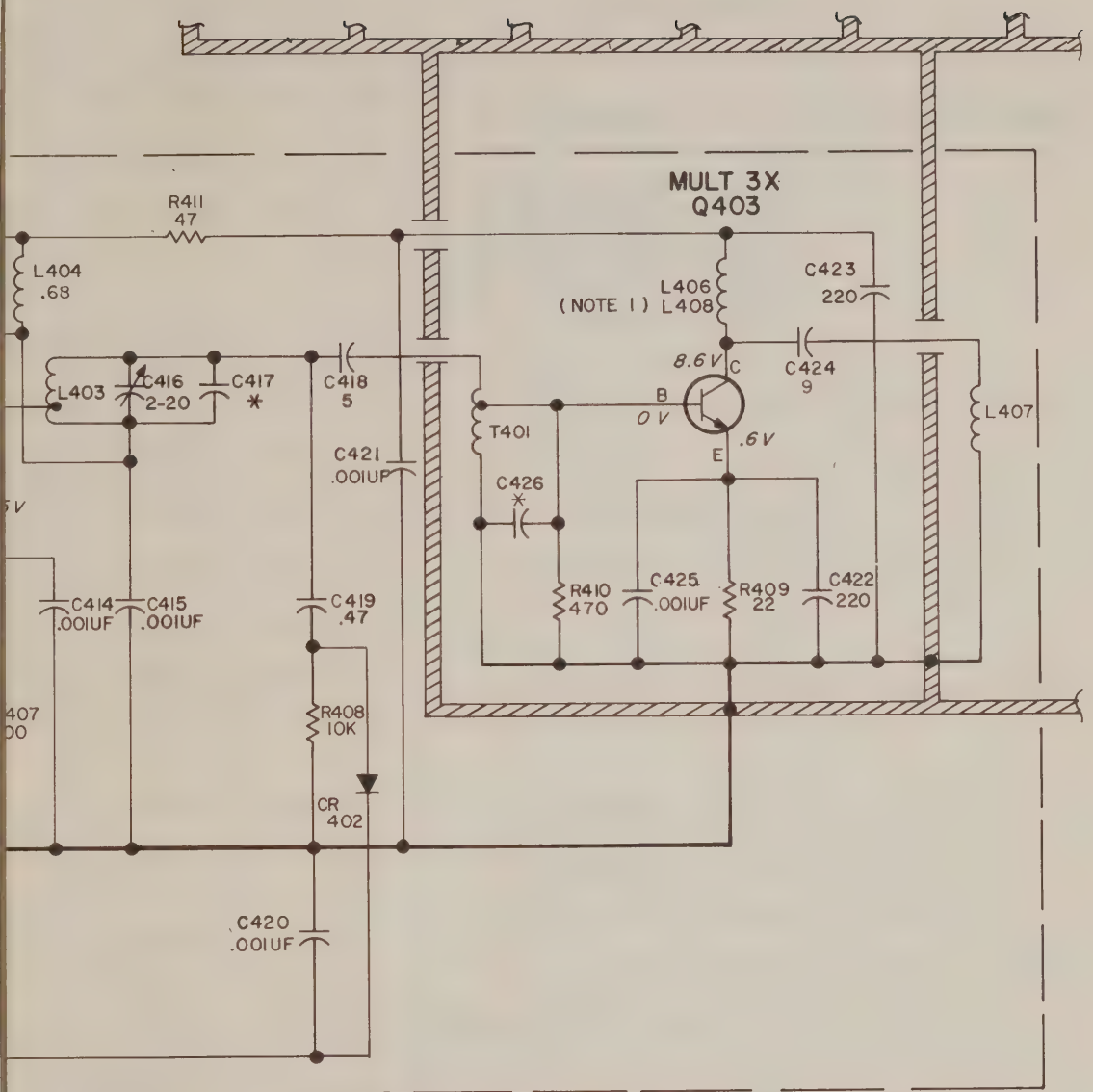
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATIONS, PREFIX WITH 400 SERIES. EXAMPLE: C1-C401, R1-R401, ETC...

(19D423790, Rev. 6)



OUTLINE DIAGRAM

406—512 MHz OSCILLATOR/MULTIPLIER BOARD 19D423266G1-G8



	ADAPT A STANDARD MASTR II RECEIVER TO OPERATION THESE COMPONENTS SHOULD BE VER. BOARDS IDENTIFIED BY A RED DOT ERATION PER MOD KIT 19A129750G1 OR G2
	D.F.E. CHANNEL
E	NO MODIFICATION REQUIRED ON THE IF FILTER BD
	ON PL19D417072 (OSC/MULT BD) 1. N24-W-BL JUMPER ADDED BETWEEN H1 & H2 ON OSC/MULT BD.
	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

	DAPT A STANDARD RECEIVER TO 9-12 FREQ. OPERATION.
	C407LL C407L C407LM
	N KIT PL19A12973762.

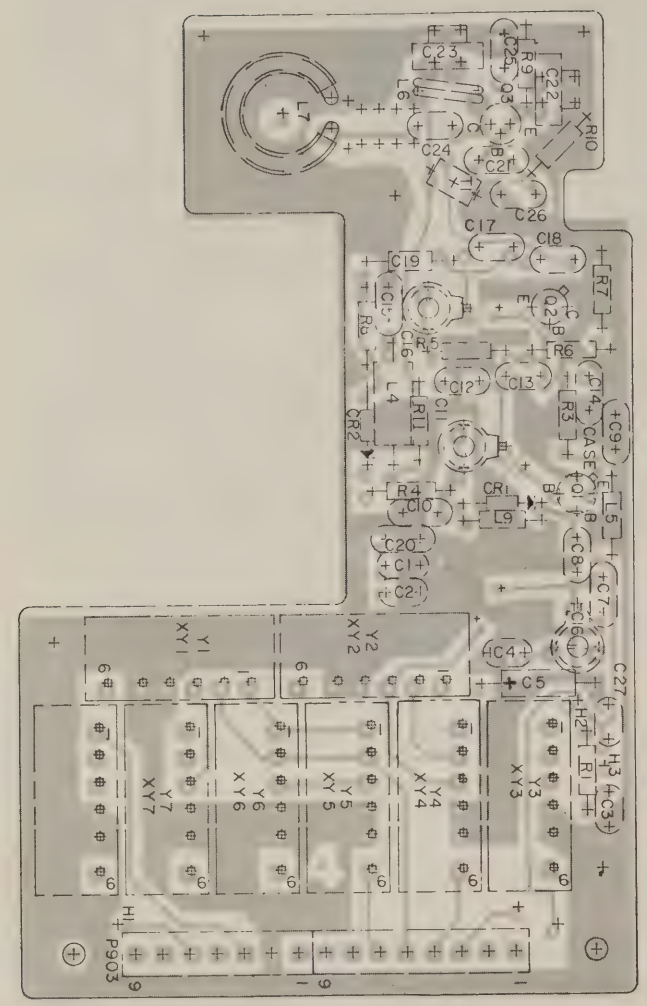
	REV LETTER	FREQ RANGE (MHZ)	NO. OF FREQ
OSC/MULT BD			
19D423266G1	K	406-420	2
19D423266G2	J	450-470	2
19D423266G3	K	470-494	2
19D423266G4	H	494-512	2
19D423266G5	K	406-420	8
19D423266G6	J	450-470	8
19D423266G7	K	470-494	8
19D423266G8	H	494-512	8
19D423266G9	G	420-450	2
19D423266G10	G	420-450	8

SCHEMATIC DIAGRAM

406—512 MHz OSCILLATOR/MULTIPLIER BOARD 19D423266G1-G8

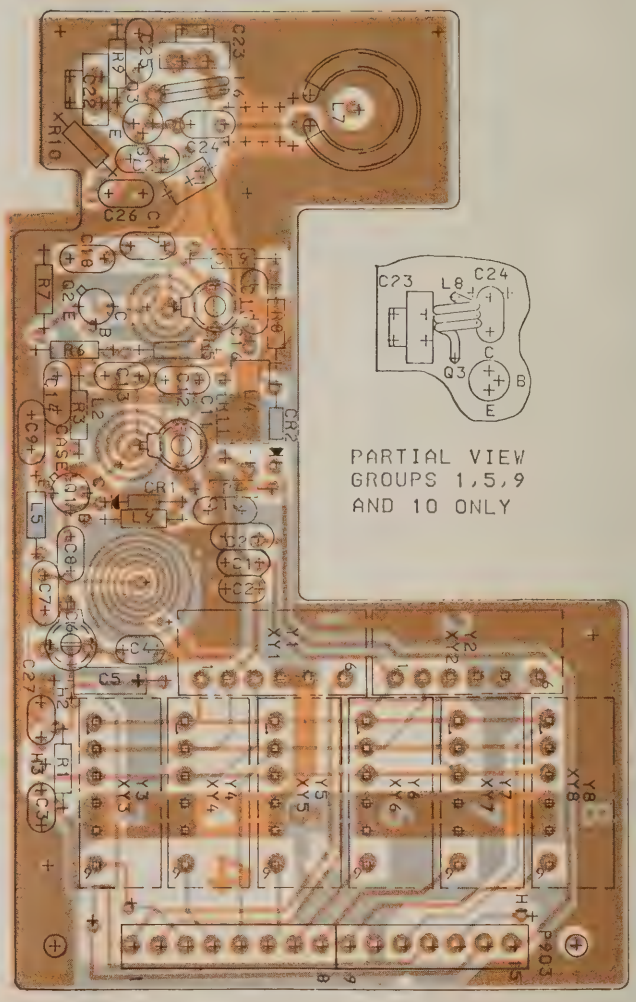
OSC/MULT BD

SOLDER SIDE



(19D423267, Sh. 2, Rev. 4)

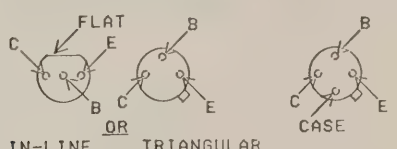
COMPONENT SIDE



PARTIAL VIEW
GROUPS 1,5,9
AND 10 ONLY

(19D423267, Sh. 2, Rev. 4)
(19D423267, Sh. 3, Rev. 4)

LEAD IDENTIFICATION
FOR Q2 AND Q3 FOR Q1



IN-LINE TRIANGULAR

TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

NOTE

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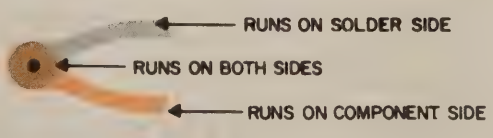
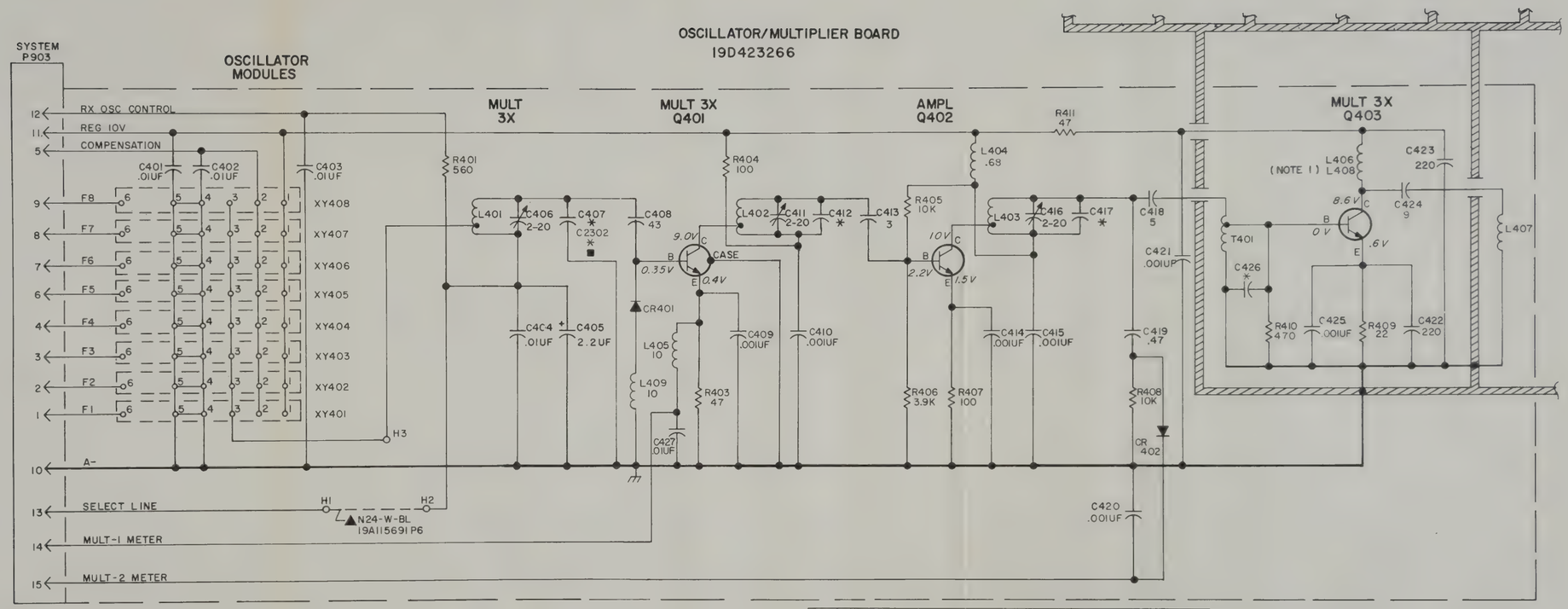
(19D423790, Rev. 6)



OUTLINE DIAGRAM

406—512 MHz OSCILLATOR/MULTIPLIER
BOARD 19D423266G1-G8



NOTE: 1. L406 - G2, G3, G4, G6, G7, & G8
L408 - G1, G5, G9 & G10

* COMPONENT VALUE TABLE					
COMP. DESIGN	LL	L	M	H	I M
RF FREQ (MHz)	406-420	450-470	470-494	494-512	420-450
C407	24	18	12	13	18
C412	12	6	5	4	8
C417	6	3	–	–	3
C426	12	8	6	6	10
C2302	18	3	–	–	10

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD MASTR II RECEIVER TO OPERATION AS AND WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2

RECEIVER CHANNEL	D.F.E. CHANNEL
SEE IF FILTER BD FOR OTHER DFE CHANGES	NO MODIFICATION REQUIRED ON THE IF FILTER BD
ON PL19D417072 (OSC/MULT BD) NO MODIFICATION REQUIRED	ON PL19D417072 (OSC/MULT BD) 1. N24-W-BL JUMPER ADDED BETWEEN H1 & H2 ON OSC/MULT BD.
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G1.	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

■ THESE COMPONENTS USED TO ADAPT A STANDARD RECEIVER TO 9-12 FREQ. OPERATION.

OSC/MULT BD) 19D423266
1. C2302LL IS USED INSTEAD OF C407LL
2. C2302L IS USED INSTEAD OF C407L
3. C2302LM IS USED INSTEAD OF C407LM
THESE ITEMS ARE SUPPLIED IN KIT PL19A129737G2. (MOD DRAWING 19D417218)

	REV LETTER	FREQ RANGE (MHZ)	NO. OF FREQ
OSC/MULT BD			
19D423266G1	K	406-420	2
19D423266G2	J	450-470	2
19D423266G3	K	470-494	2
19D423266G4	H	494-512	2
19D423266G5	K	406-420	8
19D423266G6	J	450-470	8
19D423266G7	K	470-494	8
19D423266G8	H	494-512	8
19D423266G9	G	420-450	2
19D423266G10	G	420-450	8

SCHEMATIC DIAGRAM

406—512 MHz OSCILLATOR/MULTIPLIER BOARD 19D423266G1-G8

	GE PART NO.	DESCRIPTION
		9-12 FREQ. MOD KIT 19A129737G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
	19A116656P7K1	Ceramic disc: 7 pf ±1 pf, 500 VDCW, temp coef -150 PPM.
	19A116656P10K1	Ceramic disc: 10 pf ±1 pf, 500 VDCW, temp coef -150 PPM.
L	19A116656P18J8	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
	19A116656P3J8	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
M	19A116656P10J8	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	4031594P1	Insulator. (Located under C406, C411, C416).
	19A701332P1	Insulator: sim to Thermalloy 7717-46. (Used with Q403).

PRODUCTION CHANGES

in the equipment to improve performance or to simplify circuits are identified by a "Revision hich is stamped after the model number of the unit. The revision stamped on the unit includes all revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

- 19D423266G1 & G5

To improve operation of oscillator/multiplier in 406-420 MHz band. Deleted coil L406 and added coil L408.

- 19D423266G1 & G5
- 19D423266G2-G4 & G6-G8

To provide uniform output over multi-frequency range. Changed Q401.

- 19D423266G2-G4 & G6-G8
- 19D423266G1 & G5

To increase output of OSC/MULT board with multiple ICOMs. Added L409.

- 19D423266G1 & G5
- 19D423266G2-G4 & G6-G8

To improve drive to first Multiplier. Changed C408.

- 19D423266G1, G5
- 19D423266G2, 3, 4, 6, 7, 8
- 19D423266G9, G10

To allow operation in 420-450 MHz range. Deleted L406. Added L408.

- 19D423266G9, G10

To improve tuning. Changed C412, C417 and C425 in Groups 1 and 5. Changed C425 in Groups 2, 3, 6, 7, 9 and 10.

- 19D423266G1 & G5
- 19D423266G2, G3, G6, G7
- 19D423266G9 & G10

To improve operation. Deleted C424LL, C424L, C424LM, C424M and C424H. Added C424 (19A116656P7J0) for Groups 1 thru 10.

- 19D423266G1 & G5
- 19D423266G2, G3, G6 & G7
- 19D423266G4 & G8
- 19D423266G9 & G10

To improve operation of multiplier operation. Changed C424, C425 and R410.

- 19D423266G1 & G5
- 19D423266G2, G3, G6 & G7
- 19D423266G4 & G8
- 19D423266G9 & G10

To incorporate new transistor. Changed Q402.

- 19D423266G1 & G5
- 19D423266G2, G3, G6 & G7
- 19D423266G4 & G8
- 19D423266G9 & G10

To increase the injection level to provide better sensitivity. Deleted C426, added C426LL, C426LM, C426L, C426M and C426H. Changed R410 and T401. Components were: C426 - 19A116656P3K0, Ceramic disc; 3 pf ±1 pf, 500 VDCW, temp coef 0PPM. R410 - 19A700106P39, composition; 100 ohms ±5%, 1/4 W. T401 - 19A129920G1; coil.

- 19D423266G1, G3 & G7
- 19D423266G2 & G6
- 19D423266G4, G5 & G8
- 19D423266G9 & G10

To prevent the receiver from self-quieting, caused by IF getting into the oscillator-multiplier on the 10 Volt line. Changed C401. C401 was: 19A116655P19 - Ceramic disc; 1000 pf ±20%, 1000 VDCW; sim to RMC type JF Discap.

MAINTENANCE MANUAL

IF/AUDIO AND SQUELCH BOARD 19D417707G1, G2 AND 19D432667G1, G2

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DESCRIPTION

The IF/Audio and Squelch Board (IFAS) provides 120 dB IF gain, detects audio and provides squelch control. The IFAS board operates with an IF frequency of 11.2 or 9.4 MHz depending on the operating frequency of the radio. IFAS Board 19D417707G1 or 19D432667G1 operate with an IF frequency of 11.2 MHz and are used in radios operating in the following frequency bands:

- 25 - 30 MHz
- 36 - 42 MHz
- 66 - 88 MHz
- 138 - 174 MHz
- 406 - 420 MHz
- 450 - 512 MHz

IFAS Board 19D417707G2 or 19D432667G2 operate with an IF frequency of 9.4 MHz and are used in radios operating in the 30-36 MHz, 42-50 MHz, and 806-825 MHz frequency bands.

SERVICE NOTE: IFAS Board 19D417707 uses fix-tuned coil asemblies Z601, Z602 and Z603. IFAS Board 19D432667 uses tuneable coil assemblies T602, T603 and T604.

CIRCUIT ANALYSIS

Crystal Filters, IF Amp & Limiter

The IF input from the MIF or IF Filter board is applied to a four-pole monolithic crystal filter (FL601 and FL602). The crystal filter provides additional selectivity and is followed by impedance matching network Z601/T602 and IF Amplifier IC U601. The IC amplifier provides approximately 60 dB of gain.

Final IF selectivity is provided by a two-pole crystal filter FL603. Impedance matching network Z602/T603 matches the output impedance of IF amplifier IC U601 to the input of two-pole crystal filter FL603. The IF amplifier output is metered at J601 through a metering network consisting of C644, C611, C612, CR601 and CR602. Impedance matching network Z603/T604 matches the output impedance of FL603 to the input of Limiter/Detector IC U602.

In addition to providing 60 dB of gain at the IF frequency, Limiter Detector IC U602, C619, C620 and L603/L606 comprise a quadrature phase detector to recover the audio from the IF frequency. The quadrature phase detector utilizes a 90 degree phase shift in the IF frequency to detect the audio signal. It compares the phase of the IF input at U602-4 with the same IF input frequency shifted 90 degrees at U602-2. The resultant signal varies phase linearly as the carrier signal deviates about the center frequency.

The detector output is adjusted for maximum audio output by L603/L606 and is metered at J601 through R607.

AUDIO PREAMPLIFIER

The audio preamplifier consists of transistors Q601, Q602 and Q605. It provides approximately 26 dB of gain.

The output of the Limiter/Detector is coupled to the audio preamplifier through audio level adjust control R608. R608 sets the audio input level to the preamplifier circuit.

The output of the audio preamplifier is coupled through a low pass filter (L604 and C624) to volume and squelch control high. The filter removes any IF signal remaining in the audio output of the preamplifier.

PARTS LIST

LB130030G

406-512 MHz OSCILLATOR/MULTIPLIER
19D423266G1-G10

SYMBOL	GE PART NO.	DESCRIPTION
		19D423266G1 2 FREQ 406-420 MHz (LL) REV K 19D423266G2 2 FREQ 450-470 MHz (L) REV J 19D423266G3 2 FREQ 470-494 MHz (M) REV K 19D423266G4 2 FREQ 494-512 MHz (L) REV H 19D423266G5 8 FREQ 406-420 MHz (LL) REV K 19D423266G6 8 FREQ 450-470 MHz (L) REV J 19D423266G7 8 FREQ 470-494 MHz (M) REV K 19D423266G8 8 FREQ 494-512 MHz (H) REV H 19D423266G9 2 FREQ 420-450 MHz (LM) REV G 19D423266G10 8 FREQ 420-450 MHz (LM) REV G
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C401 thru C404	19A700234P7	Polyester: 0.01 µf ±10%, 50 VDCW.
C405	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C406	19A700012P2	Variable, ceramic: 2.5 to 20 pf, 200 VDCW, temp coef -250 -700 PPM/°C; sim to Panasonic ECV-1ZW20X32.
C407LL	19A143491P24J8	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C407L	19A143491P18J8	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C407M	19A143491P12J0	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C407H	19A143491P13J8	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C408*	19A116656P43J0	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef 0 PPM. In G1 & G5 of REV C & earlier: In G2-G4, G6-G8 of REV B & earlier:
	19A116656P15J0	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
C409 and C410	19A143481P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C411	19A700012P1	Variable, ceramic: 2 to 10 pf, 200 VDCW, temp coef -350 +500 PPM/°C; sim to Panasonic ECV-1ZW10X32.
C412LL*	19A143491P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM. In REV D & earlier:
	19A116656P10J0	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C412L	19A143491P6G0	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C412LM	19A143491P8J0	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C412M	19A143491P5G0	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C412H	19A143491P4G0	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C413	19A143491P3K0	Ceramic disc: 3 pf ±1 pf, 500 VDCW, temp coef 0 PPM.
C414 and C415	19A143481P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C416	19A700012P1	Variable, ceramic: 2 to 10 pf, 200 VDCW, temp coef -350 +500 PPM/°C; sim to Panasonic ECV-1ZW10X32.
C417LL*	19A143491P6G0	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM. In REV D & earlier:
	19A116656P4G0	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C417L	19A143491P3G0	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C418	19A143491P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C419	5491601P13	Phenolic: 0.47 pf ±10%, 500 VDCW.
C420 and C421	19A143481P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C422 and C423	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C424*	19A143491P9J0	Ceramic disc: 9 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM. In G1 & G5 REV F: In G2, G3, G6 & G7 REV E: In G4 & G8 REV D: In G9 & G10 REV C:
	19A116656P7J0	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM. Added to G1 & G5 by REV F. Added to G2, G3, G6, G7 by REV E. Added to G9 & G10 by REV C.
C424LL*	19A116656P9K0	Ceramic disc: 9 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Added to G1 & G5 by REV E. Deleted in G1 & G5 by REV F.
C424L*	19A116656P9K0	Ceramic disc: 9 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Added to G2 & G6 by REV D. Deleted in G2 & G6 by REV E.
C424LM*	19A116656P9K0	Ceramic disc: 9 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Added to G9 & G10 by REV B. Deleted in G9 & G10 by REV C.
C424M*	19A116656P9K0	Ceramic disc: 9 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Added to G3 & G7 by REV D. Deleted in G3 & G7 by REV E.
C424H*	19A116656P7J0	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM. Added to G4 & G8 by REV D.
C424*	19A116656P9K0	Ceramic disc: 9 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Deleted by REV K in G1 & G5. Deleted by REV D in G2-G4, G6-G8. Deleted by REV B in G9, G10.
C425*	19A143481P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. In REV D-F:
	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
		In REV C & earlier;
	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C426	19A116656P3K0	Ceramic disc: 3 pf ±1 pf, 500 VDCW, temp coef 0 PPM.
C426LL	19A143491P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C426LM	19A143491P10J0	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C426L	19A143491P8J0	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C426M	19A143491P6J0	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C426H	19A143491P6J0	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C427	19A700234P7	Polyester: 0.01 µf ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR402	19A116052P5	Silicon, capacitive.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
LA01 thru LA03		(Part of printed board).
LA06*	19A129711P1	Coil. Deleted in G1, G5 by REV A.
LA07	19A129710P1	Coil.
LA08*	19A129352P8	Coil. Added to G1, G5 by REV A.
P903		- - - - - - - - - - PLUGS - - - - - - - - - - Includes:
	19B219594P1	Terminal strip: 7 pins.
	19B219594P2	Terminal strip: 8 pins.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q401*	19A134447P1	Silicon, NPN; sim to Type 2N5179. In G1, G5 of REV A & earlier; in G2-G4, G6-G8 earlier than REV A:
	19A115440P1	Silicon, NPN.
Q402	19A116899P1	Silicon, NPN; sim to Type 2N2368.
Q403	19A116201P1	Silicon, NPN.
		- - - - - - - - TRANSFORMERS - - - - - - - - - -
T401	19A127108G3	Coil.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY401 thru XY408	19A701785P1	Contact, electrical: sim to Molex 08-50-0404. (Quantity 6 for each socket).
		ASSOCIATED ASSEMBLIES
		- - - - - - - - OSCILLATOR MODULES - - - - - - - -
		NOTE: When reordering specify ICOM Frequency. FOR STANDARD LOW SIDE INJECTION FREQUENCY ICOM Freq = $\frac{\text{Operating Freq} - 11.2}{27}$
Y401 thru Y408	19A129393G12	Compensated: ±5 PPM, 406-420 MHz, 450-512 MHz.
	19A129393G8	Externally Compensated: ±5 PPM, 406-420 MHz, 450-512 MHz.
	19A129393G4	Compensated: ±2 PPM, 406-420 MHz, 450-512 MHz. NOTE: FOR HIGH SIDE INJECTION FREQUENCY ICOM Freq = $\frac{\text{Operating Freq} + 11.2}{27}$
Y401 thru Y408	19A130283G6	Compensated: ±5 PPM. 406-420 MHz, 450-512 MHz.
	19A130283G4	Externally Compensated: ±5 PPM, 406-512 MHz.
	19A130283G2	Compensated: ±2 PPM, 406-512 MHz.
		DUPLEX HIGH SIDE INJECTION KIT 19A130045G5
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2315	19A116656P13J8	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C2316	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2317	19A116656P8J8	Ceramic disc: 8 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C2318	19A116656P10J8	Ceramic disc: 10 pf ±5%, 500 VDCW, temp coef -80 PPM.
C2319	19A116656P4J0	Ceramic disc: 4 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2320	19A116656P6J8	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C2321	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2301H	19A116656P7K1	
C2301L	19A116656P10K1	
C2302LL	19A116656P18J8	
C2302L	19A116656P3J8	
C2302LM	19A116656P10J8	
	4031594P1	
	19A701332P1	

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUC

Changes in the equipment to improve pe
Letter," which is stamped after the model
previous revisions. Refer to the Parts Li

REV. A - 19D423266G1 & G5
To improve operation
band. Deleted coil

REV. B - 19D423266G1 & G5
REV. A - 19D423266G2-G4 & G6-
To provide uniform o
Changed Q401.

REV. B - 19D423266G2-G4 & G6-
REV. C - 19D423266G1 & G5
To increase output o
Added L409.

REV. D - 19D423266G1 & G5
REV. C - 19D423266G2-G4 & G6-
To improve drive to

REV. E - 19D423266G1, G5
REV. D - 19D423266G2, 3, 4, 6
REV. A - 19D423266G9, G10
To allow operation i
Added L408.

REV. B - 19D423266G9, G10
To improve tuning.
and 5. Changed C425

REV. F - 19D423266G1 & G5
REV. E - 19D423266G2, G3, G6,
REV. C - 19D423266G9 & G10
To improve operation
and C424H. Added C4

REV. G - 19D423266G1 & G5
REV. F - 19D423266G2, G3, G6
REV. E - 19D423266G4 & G8
REV. D - 19D423266G9 & G10
To improve operation
C425 and R410.

REV. H - 19D423266G1 & G5
REV. G - 19D423266G2, G3, G6
REV. F - 19D423266G4 & G8
REV. E - 19D423266G9 & G10
To incorporate new t

REV. J - 19D423266G1 & G5
REV. H - 19D423266G2, G3, G6
REV. G - 19D423266G4 & G8
REV. F - 19D423266G9 & G10
To increase the inje
Deleted C426, added
Changed R410 and T40
Ceramic disc; 3 pf ±
19A700106P39, compos
coil.

REV. K - 19D423266G1, G3 & G7
REV. J - 19D423266G2 & G6
REV. H - 19D423266G4, G5 & G8
REV. G - 19D423266G9 & G10
To prevent the recei
into the oscillator-
C401 was: 19A116655P
sim to RMC type JF D

MOBILE RADIO

MAINTENANCE MANUAL

IF/AUDIO AND SQUELCH BOARD 19D417707G1, G2 AND 19D432667G1, G2

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DESCRIPTION

The IF/Audio and Squelch Board (IFAS) provides 120 dB IF gain, detects audio and provides squelch control. The IFAS board operates with an IF frequency of 11.2 or 9.4 MHz depending on the operating frequency of the radio. IFAS Board 19D417707G1 or 19D432667G1 operate with an IF frequency of 11.2 MHz and are used in radios operating in the following frequency bands:

- 25 - 30 MHz
- 36 - 42 MHz
- 66 - 88 MHz
- 138 - 174 MHz
- 406 - 420 MHz
- 450 - 512 MHz

IFAS Board 19D417707G2 or 19D432667G2 operate with an IF frequency of 9.4 MHz and are used in radios operating in the 30-36 MHz, 42-50 MHz, and 806-825 MHz frequency bands.

SERVICE NOTE: IFAS Board 19D417707 uses fix-tuned coil asemblies Z601, Z602 and Z603. IFAS Board 19D432667 uses tuneable coil assemblies T602, T603 and T604.

CIRCUIT ANALYSIS

Crystal Filters, IF Amp & Limiter

The IF input from the MIF or IF Filter board is applied to a four-pole monolithic crystal filter (FL601 and FL602). The crystal filter provides additional selectivity and is followed by impedance matching network Z601/T602 and IF Amplifier IC U601. The IC amplifier provides approximately 60 dB of gain.

Final IF selectivity is provided by a two-pole crystal filter FL603. Impedance matching network Z602/T603 matches the output impedance of IF amplifier IC U601 to the input of two-pole crystal filter FL603. The IF amplifier output is metered at J601 through a metering network consisting of C644, C611, C612, CR601 and CR602. Impedance matching network Z603/T604 matches the output impedance of FL603 to the input of Limiter/Detector IC U602.

In addition to providing 60 dB of gain at the IF frequency, Limiter Detector IC U602, C619, C620 and L603/L606 comprise a quadrature phase detector to recover the audio from the IF frequency. The quadrature phase detector utilizes a 90 degree phase shift in the IF frequency to detect the audio signal. It compares the phase of the IF input at U602-4 with the same IF input frequency shifted 90 degrees at U602-2. The resultant signal varies phase linearly as the carrier signal deviates about the center frequency.

The detector output is adjusted for maximum audio output by L603/L606 and is metered at J601 through R607.

AUDIO PREAMPLIFIER

The audio preamplifier consists of transistors Q601, Q602 and Q605. It provides approximately 26 dB of gain.

The output of the Limiter/Detector is coupled to the audio preamplifier through audio level adjust control R608. R608 sets the audio input level to the preamplifier circuit.

The output of the audio preamplifier is coupled through a low pass filter (L604 and C624) to volume and squelch control high. The filter removes any IF signal remaining in the audio output of the preamplifier.

AUDIO IC

The hybrid audio IC (U604) uses a custom flip-chip monolithic integrated circuit. The audio IC contains a standard EIA Channel Guard tone reject filter, a receiver de-emphasis circuit and the low level audio PA drive circuitry.

Audio from the preamplifier is coupled through the VOLUME control to pin 4 of the audio IC from P904-13 (VOL ARM). Audio at pin 4 is applied to the Channel Guard tone reject circuit, and then to the 6 dB/octave de-emphasis circuit. The filter output is coupled through C635 to the differential audio driver circuit. The output of the audio driver circuit is DC coupled to the push-pull, Class AB audio PA transistors, Q603 and Q604. The PA output is coupled through audio transformer T601 rated power to the 8 ohm loudspeaker. R619 and C637 in the transformer secondary protects the PA transistors against a "no-load" or open circuit. Feedback from windings T601-3 and -4 determines the gain of the audio driver amplifier.

When the receiver is squelched, pin 1 of audio IC U604 is near A-, and the entire audio circuit is turned off to eliminate current drain. Pin 1 is also connected to the system board through P904-7 (RX MUTE) so that the receiver audio can be disabled by the time delay circuit in the 10 Volt regulator, and by the Channel Guard option when used.

Pins 6 & 7 are connected to the system board through P904-16 (RX PA) and P904-21 (INTCM INPUT) so that the receiver audio stages can be used to provide an audio output when the radio is equipped with the Intercom option.

Pin 2 is connected to the system board through P904-6 (SQ DISABLE) so that the receiver audio stages can be independently activated and used to provide an alert tone output when the radio is equipped with the Carrier controlled Timer option.

SQUELCH IC

The hybrid squelch IC (U603) also uses a custom flip-chip monolithic integrated circuit. The squelch IC contains the noise amplifier, active noise filter, detector, slow and fast squelch circuits as well as the receiver unsquelched sensor (RUS) switch and carrier activity sensor (CAS) switch.

Noise Amp, Filter & Active Detector

Noise from the limiter/detector is coupled through the SQUELCH control to pins 1 and 2 on the squelch IC. This signal is applied to the noise amplifier and then to the active filter circuit.

The noise amp and active filter provide the gain and selectivity to distinguish between noise and audio. The filter output drives the active detector circuit to provide the squelch switching functions. Thermistor RT601 keeps the input to the active detector constant over wide variations in temperature.

Slow And Fast Squelch

With a signal below the 20 dB quieting level, the slow squelch circuit provides a conventional slow (200 millisecond) squelch operation to prevent rapid squelch opening and closing in weak signal areas.

A signal at or above the 20 dB quieting level is sensed by the signal level detector and activates the fast squelch circuit, providing a fast (10 millisecond) squelch operation.

The squelch circuits have two outputs. One output control the squelch switch and the other output controls the CAS switch.

NOTE

In Station applications, the Fast Squelch function is disabled by removing C630.

Squelch Switch

The squelch switch output at pin 7 is connected to pin 1 of the audio IC. When the receiver is squelched, the output pin at 7 is near A-. This keeps the receiver audio stages turned off, muting the receiver. When the receiver is quieted by an on-frequency signal (unsquelches), the voltage at pin 7 rises to approximately +10 Volts. This turns on the audio stages and sound is heard at the speaker.

With the receiver unsquelched, the output of the squelch switch turns on the RUS switch. The output of the RUS switch is connected to the noise amplifier, providing a hysteresis loop in the squelch circuit. The RUS output increases the gain of the noise amplifier, preventing squelch closing on weak signals. The RUS output at pin 8 is also connected to the

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system board through P904-8 for special applications.

NOTE

In radios equipped with Channel Guard, the RUS switch will operate only when an "on-frequency" signal with the correct Channel Guard tone is applied to the receiver.

CAS Switch

The squelch circuits also drive the CAS switch. When the receiver unsquelches, the voltage at pin 6 rises to approximately 10 volts. This voltage is connected to the system board through P904-9, and is used to turn on an optional Channel Busy light on the control unit.

NOTE

The CAS switch will operate whenever an "on-frequency" signal is received, with or without a correct Channel Guard tone.

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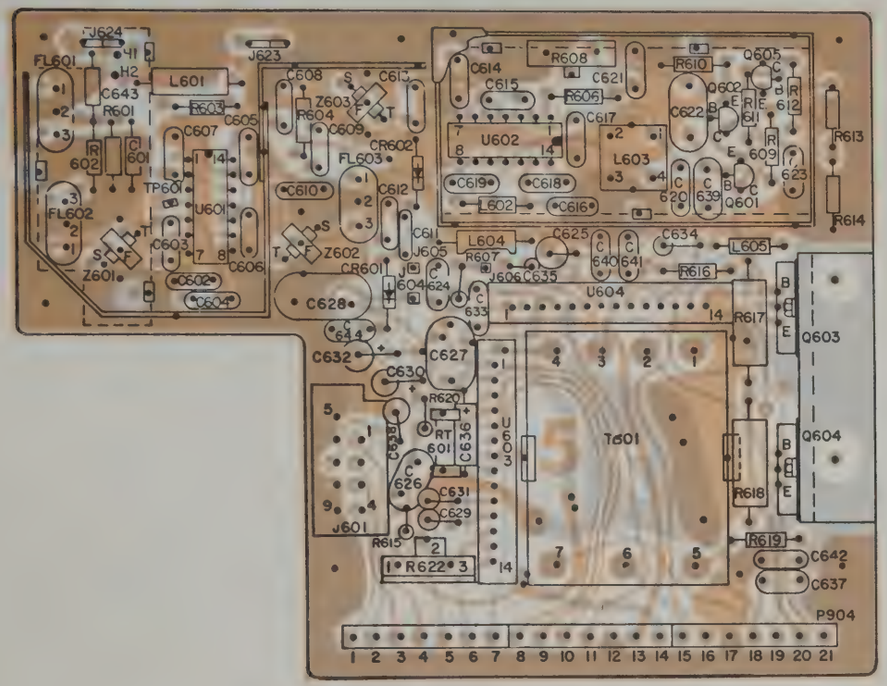
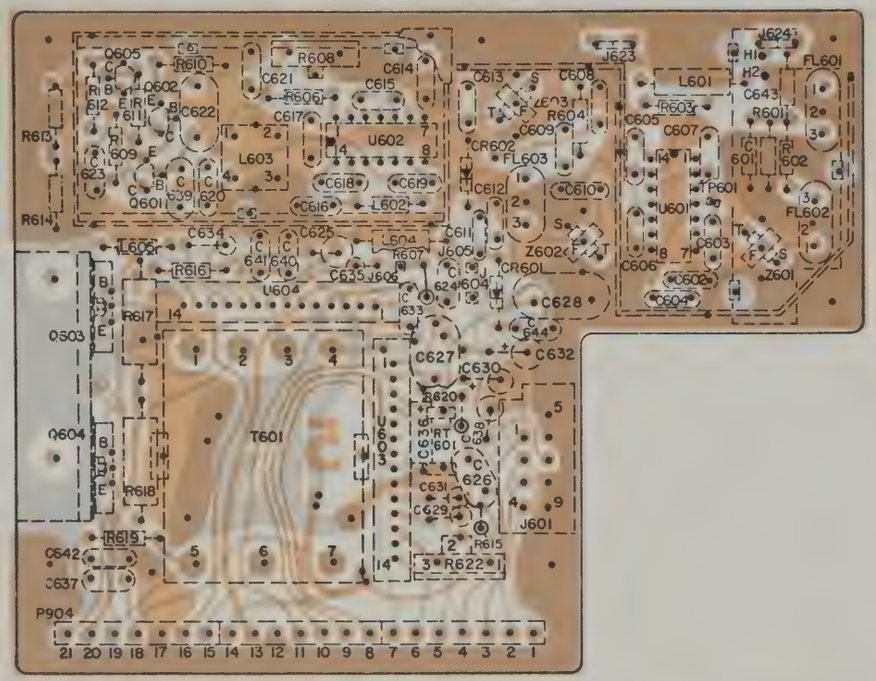
IF/AUDIO/SQUELCH BOARD 19D417707G1 & G2
(EARLY MODELS)

COMPONENT SIDE



(19D423789, Sh. 2, Rev. 7)
(19D423789, Sh. 3, Rev. 5)

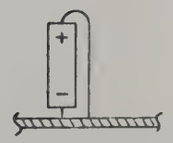
SOLDER SIDE



(19D423789, Sh. 2, Rev. 7)

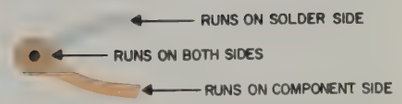
LEAD IDENTIFICATION
FOR Q601, Q602 & Q605

NOTE: LEAD ARRANGEMENT AND NOT CASE SHAPE. IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.

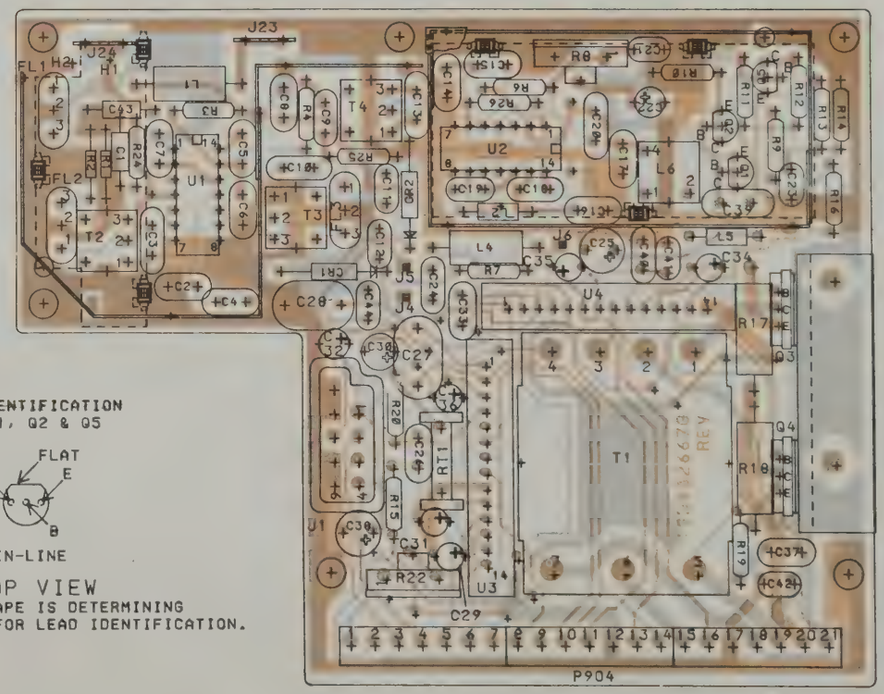


POLARITY FOR
C634,C635,C630,
C632,C625,C638,
C631 & C629

(19D423600, Rev. 8)

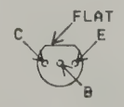


IF/AUDIO/SQUELCH BOARD 19D432667G1 & G2
(LATER MODELS)



(19D432699, Rev. 3)
(19A143716, Sh. 1, Rev. 0)
(19A143716, Sh. 2, Rev. 0)

LEAD IDENTIFICATION
FOR Q1, Q2 & Q5



TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

OUTLINE DIAGRAMS

IF/AUDIO/SQUELCH BOARDS

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH TEST SET MODEL 4EX3AII OR A 20,000 OHM-PER-VOLT METER

S=NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIMUM SQUELCH)

US=SQUELCH CONTROL FULLY CLOCKWISE

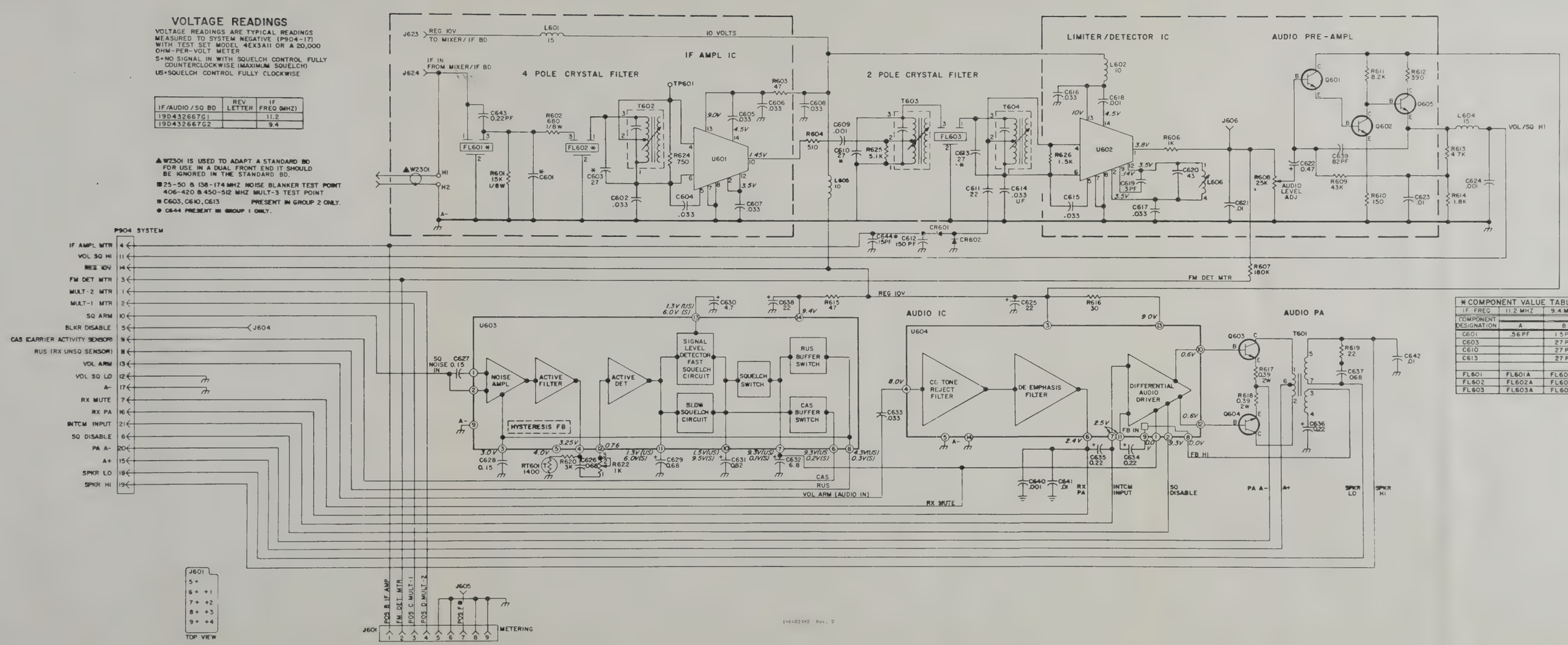
IF/AUDIO/SQ.BD	REV LETTER	IF FREQ (MHZ)
19D432667G1		11.2
19D432667G2		9.4

▲W2301 IS USED TO ADAPT A STANDARD BD FOR USE IN A DUAL FRONT END IT SHOULD BE IGNORED IN THE STANDARD BD.

■ 25-50 & 138-174 MHZ NOISE BLANKER TEST POINT
406-420 & 450-512 MHZ MULT-3 TEST POINT

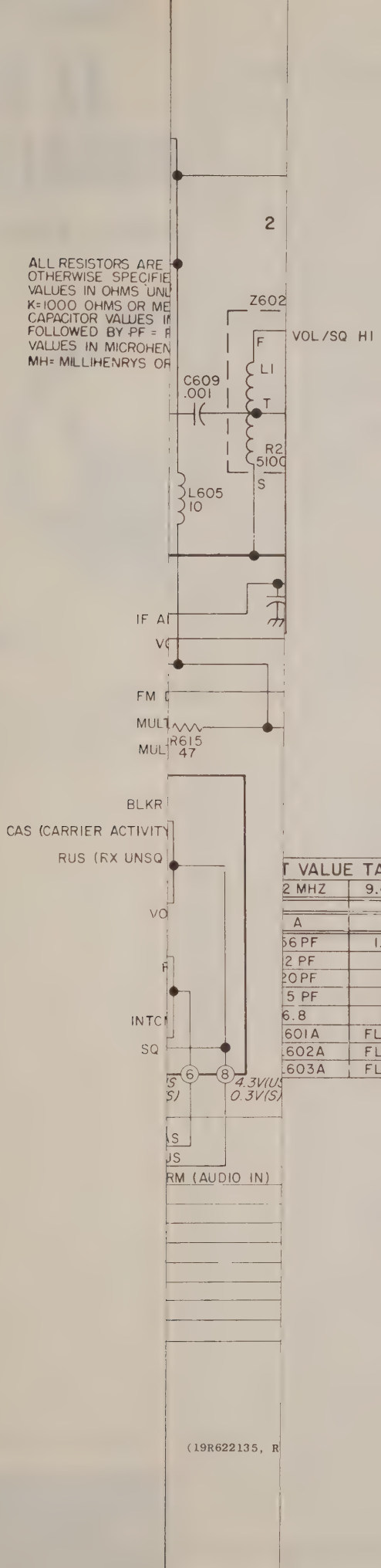
■ C603, C610, C613 PRESENT IN GROUP 2 ONLY.

● C644 PRESENT IN GROUP 1 ONLY.



ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS UNLESS FOLLOWED BY PF = PICOFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS

*COMPONENT VALUE TABLE		
IF FREQ	11.2 MHZ	9.4 MHZ
COMPONENT DESIGNATION	A	B
C601	.56 PF	1.5 PF
C603		27 PF
C610		27 PF
C613		27 PF
FL601	FL601A	FL601B
FL602	FL602A	FL602B
FL603	FL603A	FL603B



T VALUE TABLE	
2 MHZ	9.4 MHZ
A	B
56 PF	1.5PF
2 PF	7PF
20PF	15PF
5 PF	18PF
6.8	8.2
601A	FL601B
602A	FL602B
603A	FL603B

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER

S=NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIMUM SQUELCH)

US=SQUELCH CONTROL FULLY CLOCKWISE

IF/AUDIO/SQ BD	REV LETTER	IF FREQ (MHZ)
19D417707G1	K	11.2
19D417707G2	K	9.4

▲W2301 IS USED TO ADAPT A STANDARD BD FOR USE IN A DUAL FRONT END IT SHOULD BE IGNORED IN THE STANDARD BD.

■25-50 & 138-174 MHZ NOISE BLANKER TEST POINT
406-420 & 450-512 MHZ MULT-3 TEST POINT

✱C644 IN GROUP I ONLY.

SCHEMATIC DIAGRAM

IF/AUDIO/SQUELCH BOARD
19D417707G1 AND G2

****

PARTS LIST

IF/AUDIO/SQUELCH BOARD
19043266701 11.2 MHz IF/AUDIO SQUELCH (A)
19043266702 9.4 MHz IF/AUDIO SQUELCH (B)
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C[illegible]4	19A700013P10	Phenolic: 0.56 pF ±5%, 500 VDCW.
C[illegible]18	19A700013P15	Phenolic: 1.50 pF ±5%, 500 VDCW.
C602	19A700234P10	Polyester: 0.033 uF ±10%, 50 VDCW.
C603	19A701624P118	Ceramic, disc: 27 pF ±5%, 500 VDCW, temp coef N80 PPM ±30.
C604 thru C606	19A700234P10	Polyester: 0.033 uF ±10%, 50 VDCW.
C6[illegible]	19A701602P19	Ceramic: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6[illegible]	19A701624P118	Ceramic, disc: 27 pF ±5%, 500 VDCW, temp coef N80 PPM ±30.
C611	19A701624P516	Ceramic, disc: 22 pF ±5%, 500 VDCW, temp coef N470 PPM ±60.
C612	19A701602P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C613A	19A701624P118	Ceramic, disc: 27 pF ±5%, 500 VDCW, temp coef N80 PPM ±30.
C614 thru C617	19A700234P10	Polyester: 0.033 uF ±10%, 50 VDCW.
C618	19A701602P19	Ceramic: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C619	19A701624P201	Ceramic, disc: 3.0 pF ±0.5 pF, 500 VDCW, temp coef N150 PPM ±120.
C620	19A701624P223	Ceramic, disc: 43 pF ±5%, 500 VDCW, temp coef N150 ±30.
C621	19A700234P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C622	19A701534P3	Tantalum: 0.47 uF ±20%, 35 VDCW.
C623	19A700234P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C624	19A701602P19	Ceramic: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C625	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C626	19A700234P12	Polyester: 0.068 uF ±10%, 50 VDCW.
C627 and C628	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C629	19A143486P18	Tantalum: 0.68 uF ±20%, 35 VDCW.
C630	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C631	19A143486P119	Tantalum: 0.82 uF ±10%, 35 VDCW.
C632	19A143486P21	Tantalum: 6.8 uF ±20%, 35 VDCW.
C633	19A700234P10	Polyester: 0.033 uF ±10%, 50 VDCW.
C634 thru C636	19A143486P115	Tantalum: 0.22 uF ±10%, 35 VDCW.
C637	19A700234P12	Polyester: 0.068 uF ±10%, 50 VDCW.
C638	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C639	19A700105P32	Mica: 82 pF ±5%, 500 VDCW.
C640	19A701602P19	Ceramic: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C641 and C642	19A700234P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C643	19A700013P5	Phenolic: 0.22 pF ±5%, 500 VDCW.
C644	19A701624P12	Ceramic, disc: 15 pF ±5%, 500 VDCW, temp coef 0 PPM ±30.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR60[illegible] and CR602	4038056P1	Germanium, fast recovery, 20 rev. volts, fwd current 40 mA.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL601A	19B219573G3	Crystal: Resonator A - 11,200.000; Resonator B - 11,196.024 kHz.
FL601B	19B219574G3	Crystal: Resonator A - 9400.000 kHz, Resonator B - 9396.024 kHz.
FL602A		(Part of FL601A).
FL602B		(Part of FL601B).
FL603A	19B219573G6	Crystal: Resonator A - 11,200.000; Resonator B - 11,200.000 kHz.
FL603B	19B219574G1	Crystal: Resonator A - 9400.000 kHz; Resonator B - 9400.000 kHz.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J[illegible]	19B219374G1	Connector: Includes:
J[illegible] thru J606	19A700785P1	Contact, electrical; sim to Malco XO-2864.
J[illegible] thru J624	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
J[illegible]	19A116975P1	Contact, electrical.
		- - - - - - - - - - INDUCTORS - - - - - - - -
L601 and L602	19A700000P25	Coil, RF: 15 uH ±10%; sim to Jeffers 4421-9K.
L604	19A700000P25	Coil, RF: 15 uH ±10%; sim to Jeffers 4421-9K.
L605	19A700024P25	Coil, RF: 10 uH ±10%, 3.70 ohms DC res max.
L606A	19C311181G13	Coil. Includes: Tuning slug.
L606B	19C311181G14	Coil. Includes: Tuning slug.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P[illegible]	19B219594P1	Contact, electrical: 7 pins.
		- - - - - - TRANSISTORS - - - - - - - - -
Q[illegible] and Q[illegible]	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q[illegible] and Q604	19A116742P1	Silicon, NPN.
Q605	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - RESISTORS - - - - - - - -
R601	3R151P153J	Composition: 15K ohms ±5%, 1/8 w.
R602	3R151P681J	Composition: 680 ohms ±5%, 1/8 w.
R603	19A700019P21	Deposited carbon: 47 ohms ±5%, 1/4 w.
R604	19A143400P33	Deposited carbon: 510 ohms ±5%, 250 VDCW, 1/4 w.
R605	19A700019P37	Deposited carbon: 1K ohms ±5%, 1/4 w.
R607	19A700019P64	Deposited carbon: 0.18M ohms ±5%, 1/4 w.
R608	19B209358P107	Variable, carbon film: approx 800 to 25K ohms ±10%, 1/4 w; sim to CTS Type X-201.
R609	19A143400P56	Deposited carbon: 43K ohms ±5%, 250 VDCW, 1/4 w.
R610	19A700019P27	Deposited carbon: 150 ohms ±5%, 1/4 w.
R611	19A700019P48	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R612	19A700019P32	Deposited carbon: 390 ohms ±5%, 1/4 w.
R613	19A700019P45	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R614	19A700019P40	Deposited carbon: 1.8K ohms ±5%, 1/4 w.
R615	19A700019P21	Deposited carbon: 47 ohms ±5%, 1/4 w.
R616	19A143400P18	Deposited carbon: 30 ohms ±5%, 250 VDCW, 1/4 w.
R617 and R618	19B209022P5	Wirewound: 0.39 ohms ±5%, 2 w; sim to IRC Type BWH.
R619	19A700019P17	Deposited carbon: 22 ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R625	19A143400P42	Deposited carbon: 3K ohms ±5%, 250 VDCW, 1/4 w.
R622	19B209358P103	Variable, carbon film: approx 50 to 1K ohms ±10%, 0.2 w; sim to CTS Type X-201.
R624	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R625	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 1/4 w.
R626	19A700019P39	Deposited carbon: 1.5K ohms ±5%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - -
RT601	5490828P38	Thermistor: 1400 ohms ±5%, color code green and white; sim to Carborundum Type 723H-2.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T601	19A701978P1	Audio Freq: Pri: 12 ohms ±5%, Sec (1): 8 ohms ±5; Sec (2): 8 ohms ±5%.
T602 thru T604	19A134747P2	Transformer, IF: resonant freq. 10.7 MHz; sim to TOKO Inc. 154 PC-4700J3H3.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP601	8503P304F15	Solder pin.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U601 and U602	19A116445P1	Integrated circuit, linear: sim to ULN2111.
U603	19D416560G3	Hybrid Squelch.
U604	19D416573G1	Hybrid, audio.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B226657G1	Heat sink. (Includes: Q603, Q604).
	19A700088P1	Insulator, bushing. (Used with Q603, Q604).
	4028846P1	Nut, self-locking, steel: thd. size No. 4-40. (Used with Q603, Q604).
	19A700115P3	Insulator, plate. (Used with Q603, Q604).
	N187P9006C6	Machine screw, slotted, hex/washer head: 4-40 x 3/8. (Secures Q603 & Q604).
	19B226648G1	Shield. (Located by FL601, FL602).
	19B219571G1	Shield. (Located on opposite side of printed board from R601, R602).
	19B219727G1	Shield. (Located under can).
	19B219554G1	Can. (Located around U602).
	19B219555P1	Cover. (Used with can).
	19A701883P4	Contact, electrical; sim to AMP 86444-1.

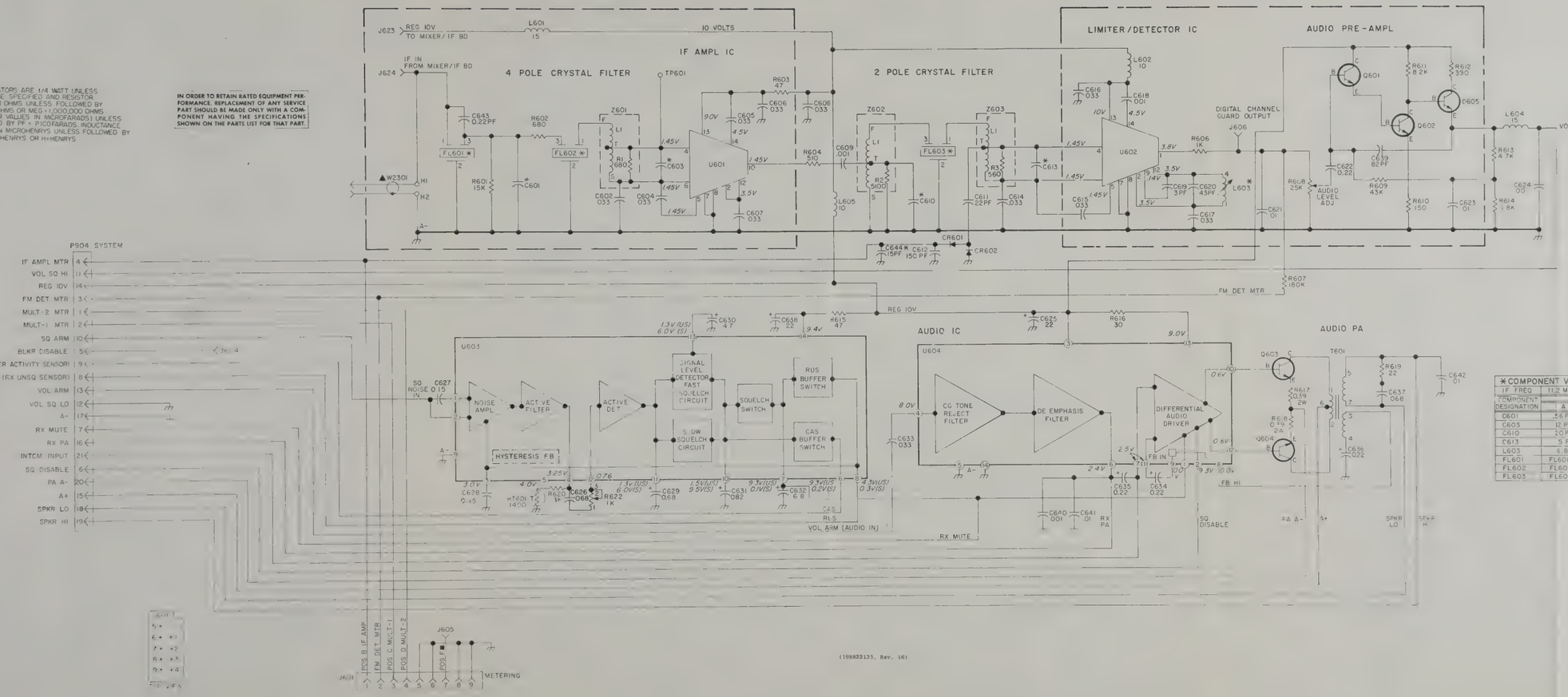
PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a Revision Letter, which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - IFAS Board 19D43266701,2

To improve receiver two signal selectivity
Deleted L603, L605 was
19A700000P25 Coil, RF, 15.0 µf ±10%,
1.20 ohms DC res. max.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



*COMPONENT VALUE TABLE		
IF FREQ	11.2 MHZ	9.4 MHZ
COMPONENT DESIGNATION	A	B
C601	.56 PF	5 PF
C603	12 PF	7 PF
C610	20 PF	15 PF
C613	5 PF	18 PF
L603	6.8	8.2
FL601	FL601A	FL601B
FL602	FL602A	FL602B
FL603	FL603A	FL603B

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

S=NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIMUM SQUELCH)

US=SQUELCH CONTROL FULLY CLOCKWISE

IF/AUDIO/SQ BD	REV LETTER	IF FREQ (MHZ)
19D417707G1	K	11.2
19D417707G2	K	9.4

▲W2301 IS USED TO ADAPT A STANDARD BD FOR USE IN A DUAL FRONT END IT SHOULD BE IGNORED IN THE STANDARD BD

■25-50 & 138-174 MHZ NOISE BLANKER TEST POINT
406-420 & 450-512 MHZ MULT-3 TEST POINT

*C644 IN GROUP I ONLY

SCHEMATIC DIAGRAM

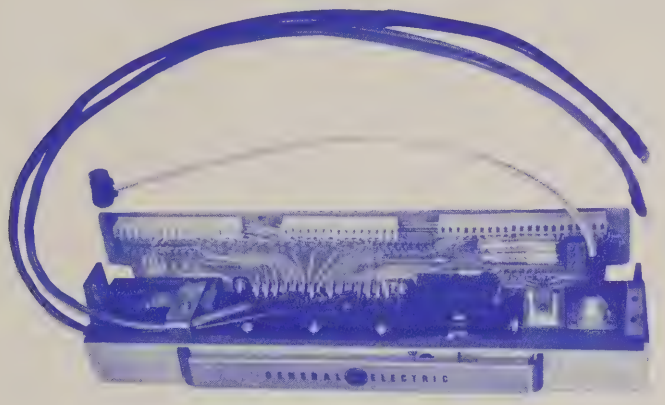
IF/AUDIO/SQUELCH BOARD
19D417707G1 AND G2

****

MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

FRONT PANEL & SYSTEM BOARD



SPECIFICATIONS *

For "M" Series Combinations	19D416653G1
For "E" Series Combinations	19D417084G1
For "E" Series Duplex Combinations	19D417084G2
Input Voltage	12 Volts DC
Output	Regulated 10 Volts DC At 0.1 to 0.5 amperes

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

Maintenance Manual LBI-4750G

DATAFILE FOLDER - DF4093

FRONT PANEL & SYSTEM BOARD 19D416653G1 & 19D417084G1, G2

PARTS LIST

LBI4986M

IF/AUDIO/SQUELCH BOARD
19D417707G1 11.2 MHz IF/AUDIO SQUELCH (A) REV K
19A417707G2 9.4 MHz IF/AUDIO SQUELCH (B) REV K

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C601A	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C601B	19A700013P15	Phenolic: 1.5 pf ±5%, 500 VDCW.
C602	19A700005P10	Polyester: 0.033 µf ±10%, 50 VDCW.
C603A	5496219P642	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -470 PPM.
C603B*	5496219P638	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
		In REV E & earlier:
	5496219P647	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -470 PPM.
C604 thru C606	19A700005P10	Polyester: 0.033 µf ±10%, 50 VDCW.
C609	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C610A	5496219P646	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -470 PPM.
C610B*	5496219P644	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -470 PPM.
		In REV K & earlier:
	5496219P649	Ceramic disc: 27 pf ±5%, 500 VDCW.
C611	5496219P647	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -470 PPM.
C612	5494481P101	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C613A*	5496219P636	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
		In REV B-D:
	5496219P642	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -470 PPM.
		In REV A & earlier:
	5496219P636	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
C613B*	5496219P645	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -470 PPM.
		In REV E:
	5496219P649	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -470 PPM.
		In REV D & earlier:
	5496219P645	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -470 PPM.
C614 thru C617	19A700005P10	Polyester: 0.033 µf ±10%, 50 VDCW.
C618	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C619	19A116656P3J1	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef -150 PPM.
C620	19A116656P43J1	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -150 PPM.
C621	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C622	19A116080P100	Polyester: 0.22 µf ±10%, 50 VDCW.
C623	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C624	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C625	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C626	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C627	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C628*	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
		In REV B & earlier:
	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C629	19A134202P13	Tantalum: 0.68 µf ±20%, 35 VDCW.
C630	19A134202P3	Tantalum: 4.7 µf ±20%, 10 VDCW.
C631	5496267P230	Tantalum: 0.82 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C632	19A134202P15	Tantalum: 6.8 µf ±20%, 35 VDCW.
C633*	19A700005P10	Polyester: 0.033 µf ±10%, 50 VDCW.
		Earlier than REV A:
	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C634 and C635	19A134202P110	Tantalum: 0.22 µf ±10%, 35 VDCW.
C636	5496267P226	Tantalum: 0.22 µf ±10%, 35 VDCW; sim to Sprague Type 150D.
C637	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C638	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C639	19A700105P32	Mica: 82 pf ±5%, 500 VDCW.
C640	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW.
C641 and C642	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C643	19A700013P5	Phenolic: 0.22 pf ±5%, 500 VDCW.
C644*	19A116656P15J0	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM. Added to G1 by REV F.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR601 and CR602	4036056P1	Germanium, fast recovery, 20 Rev volts, Fwd. current 40 mA.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL601A	19B219573G3	Crystal, freq: Resonator A: 11,200000 KHz, Resonator B: 11,196024 KHz. Resonator A: 11,200000 KHz, Resonator B: 11,196024 KHz.
FL601B	19B219574G3	Crystal, freq: Resonator A: 9400.300 KHz, Resonator B: 9396.324 KHz, Resonator A: 9400.300 KHz, Resonator B: 9396.324 KHz.
FL602A		(Part of FL601A).
FL602B		(Part of FL601B).
FL603A*	19B219573G6	Crystal, freq: Resonator A: 11,200000 KHz, Resonator B: 11,200000 KHz.
		In 19D417707G1 REV D & earlier:
	19B219573G1	Crystal, freq: Resonator A: 11,200000 KHz, Resonator B: 11,200000 KHz.
FL603B	19B219574G1	Crystal freq: Resonator A: 9400.300 KHz, Resonator B: 9400.300 KHz.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J601	19B219374G1	Connector. Includes:
	19C317957P1	Shell.
	19A116651P1	Contact, electrical; sim to Malco X0-2864.
J604 thru J606	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
J623 and J624	19A116975P1	Contact, electrical.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L601	19A700000P25	Coil, RF: 15.0 µh ±10%, 1.20 ohms DC res max.
L602	19A700024P25	Coil, RF: 10.0 µh ±10%, 3.70 ohms DC res max.
L603A	19C311181G13	Coil.
L603B	19C311181G14	Coil.
L604	19A700000P25	Coil, RF: 15.0 µh ±10%, 1.20 ohms DC res max.
L605	19A700024P25	Coil, RF: 10 µh ±10%.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P904	19B219594P1	Contact, electrical: 7 pins.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q601 and Q602	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q603 and Q604	19A116742P1	Silicon, NPN. (Part of heat sink assembly).
Q605	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R601	19A700019P51	Deposited Carbon: 15K ohms ±5%, 0.25 w.
R602	19A700019P35	Deposited Carbon: 680 ohms ±5%, 0.25 w.
R603	19A700019P21	Deposited Carbon: 47 ohms ±5%, 0.25 w.
R604	19A14340GP33	Deposited Carbon: 510 ohms ±5%, 250 VDCW; 1/4 w.
R606	19A700019P37	Deposited Carbon: 1K ohms ±5%, 0.25 w.
R607	19A700019P94	Deposited Carbon: 180K ohms ±5%, 0.25 w.
R608	19B209358P107	Variable, carbon film: approx 800 to 25K ohms ±10%, 0.25 w; sim to CTS Type X-201.
R609	19A14340DP56	Deposited Carbon: 43K ohms ±5%, 1/4 w.
R610	19A700019P27	Deposited Carbon: 150 ohms ±5%, 0.25 w.
R611	19A700019P48	Deposited Carbon: 8.2K ohms ±5%, 1/4 w.
R612	19A700019P32	Deposited Carbon: 390 ohms ±5%, 0.25 w.
R613	19A700019P45	Deposited Carbon: 4.7K ohms ±5%, 0.25 w.
R614	19A700019P40	Deposited Carbon: 1.8K ohms ±5%, 0.25 w.
R615	19A700019P21	Deposited Carbon: 47 ohms ±5%, 0.25 w.
R616	19A14340DP18	Deposited Carbon: 30 ohms ±5%, 0.25 w.
R617 and R618	19B209022P5	Wirewound: 0.39 ohms ±5%, 2 w; sim to IRC Type BWH.
R619	19A700019P17	Deposited Carbon: 22 ohms ±5%, 0.25 w.
R620	19A14340GP42	Deposited Carbon: 3K ohms ±5%, 1/4 w.
R621*	19A700019P45	Deposited Carbon: 4.7K ohms ±5%, 1/4 w. Deleted by REV A.
R622*	19B209358P103	Variable, carbon film: approx 50 to 1K ohms ±10%, 0.2 w; sim to CTS Type X-201. Added by REV B.
R623*	3R151P204J	Composition: 200K ohms ±5%, 1/8 w. Added by REV F.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT601	5490828P38	Thermistor: 1.4K ohms ±5%, color code green and white; sim to Carborundum 723M-2.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T601	19A116747P1	Audio freq: 500 to 4000 Hz, ±0.25 dB, Pri: 12.0 ocb ±5%, Sec 1: 8.0 ohms. 15 w, Sec 2: 1.4 ±0.10 VRMS.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP601	8503P304F15	Cotter pin.
		- - - - - - - INTEGRATED CIRCUITS - - - - - -
U601 and U602	19A116445P1	Linear: sim to ULN 2111.
U603*	19D416560G3	Squelch Hybrid.
		In REV B & C:
	19D416560G2	Squelch Hybrid.
		In REV A & earlier:
	19D416560G1	Squelch Hybrid.
U604	19D416073G1	Audio Hybrid.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z601*	19B226649G4	Coil assembly. Includes:
R1	19A700106P59	Resistor, composition: 680 ohms ±5%, 1/4 w.
		In REV E & earlier:
	19B226649G1	Coil assembly. Includes:
R1	3R152P681J	Resistor, composition: 680 ohms ±5%, 1/4 w.
Z602*	19B226649G5	Coil assembly. Includes:
R2	3R152P512J	Resistor, composition: 5100 ohms ±5%, 1/4 w.
		In REV E & earlier:
	19B226649G2	Coil assembly. Includes:
R2	3R152P512J	Resistor, composition: 5.1K ohms ±5%, 1/4 w.
Z603*	19B226649G6	Coil assembly. Includes:
R3	19A700106P57	Resistor, composition: 560 ohms ±5%, 1/4 w.
		In REV E & earlier:
	19B226649G3	Coil assembly. Includes:
R3	3R152P561J	Resistor, composition: 560 ohms ±5%, 1/4 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B226657G1	Heat sink. (Includes Q603, Q604).
	19A700068P1	Insulator, bushing. (Used with Q603, Q604).
	4029846P1	Hex nut: No. 4-40. (Used with Q603, Q604).
	19A700115P3	Insulator, plate. (Used with Q603, Q604).
	MI87P9006C6	Machine screw, slotted, hex/washer head: 4-40 x 3/8. (Secures Q603 & Q604).
	19B226648G1	Shield. (Located by FL601, FL602).
	19B219571G1	Shield. (Located on opposite side of printed board from K601, K602).
	19B219727G1	Shield. (Located under can).
	19B219554G1	Can. (Located around U602).
	19B219555P1	Cover. (Used with can).
	19A701883P4	Contact, electrical: sim to AMP 86444-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions

REV. A - To improve audio frequency response. Changed C633 and deleted R621.

REV. B - To improve operation of squelch circuit. Changed W603, added R622 and changed PWB from 19D417682 to 19D423789.

REV. C - To improve operation of squelch circuit. Changed C628.

REV. D - To improve operation of squelch circuit. Changed U603.

REV. E - 19D417707G1
To facilitate manufacturing. Changed C613A and FL603A.

REV. E - 19D417707G2
To improve operation. Changed C613B.

REV. F - 19D417707G2
To improve IF response. Changed C603B, C610B and C613B.

REV. F - 19D417707G1
To improve operation. Added C644.

REV. G - 19D417707G1 & G2
To improve performance of audio PA when using MASTR II Speaker out of housing or when a Non Standard Speaker is used, Added R623.

REV. H - To improve operation of audio PA at low voltage. Deleted R623 R623 was: 3R151P204J, composition: 200K ohms ±5%, 1/8 W.

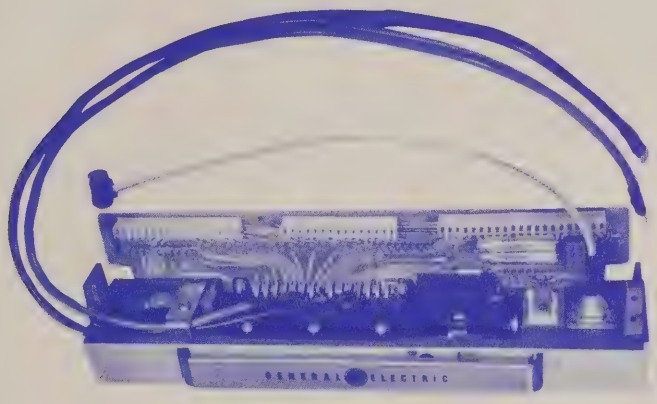
REV. J - Add output Jack to make compatible with Digital Channel Guard. Added J606.

REV. K - To prevent the receiver from self quieting. Added L605. (Also changed C401 on UHF Oscillator/Multiplier boards)

MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

FRONT PANEL & SYSTEM BOARD



SPECIFICATIONS *

For "M" Series Combinations	19D416653G1
For "E" Series Combinations	19D417084G1
For "E" Series Duplex Combinations	19D417084G2
Input Voltage	12 Volts DC
Output	Regulated 10 Volts DC At 0.1 to 0.5 amperes

*se specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

Maintenance Manual LBI4750G

DATAFILE FOLDER - DF4093

FRONT PANEL & SYSTEM BOARD 19D416653G1 & 19D417084G1, G2

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WARNING

Although the highest DC voltage in the radio is supplied by the vehicle battery, high current may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc. enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns. KEEP AWAY FROM THESE CIRCUITS when the transmitter is energized!

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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DESCRIPTION

The System Board mounts to the front casting of the radio, and terminates the power/control cable through jack J901 on the front panel. The System Board provides all power and control functions through printed wiring runs and jacks J902, J903 and J904 to the modules making up the transmitter and receiver functions.

The jack provides 30 control pins that are soldered directly to the System Board, two power pins, and holes for eight optional pins. For 38-pin connectors refer to the modification Instructions listed in the Table of Contents.

Power cables from the two power pins run directly from J901 through the left side rail to the bottom of the transmitter PA assembly.

Transmitter exciter and receiver modules plug in from the bottom to jacks on the rear of the System Board.

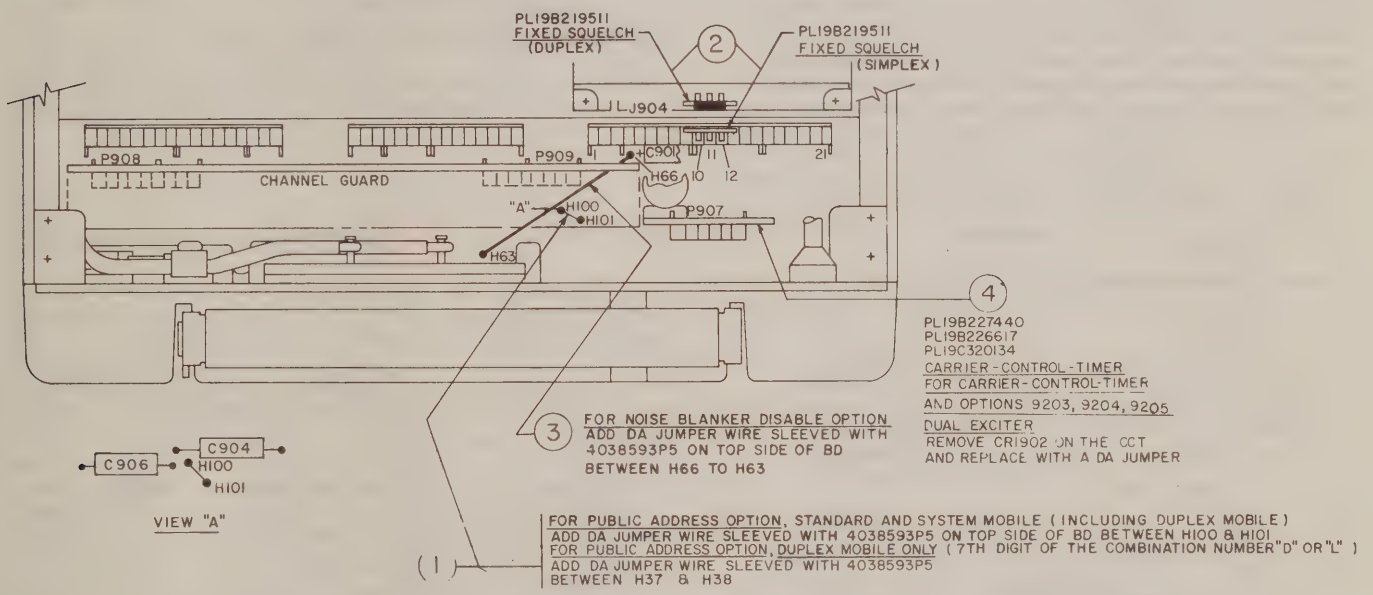
A hybrid integrated circuit 10-Volt regulator and control module, a centralized metering jack, and pins for plugging in Channel Guard, Carrier Control Timer and Fixed Squelch Options are also mounted on the System Board (see Figure 1). Also jumper connections are required for Noise Blankers and the Public Address option.

NOTE

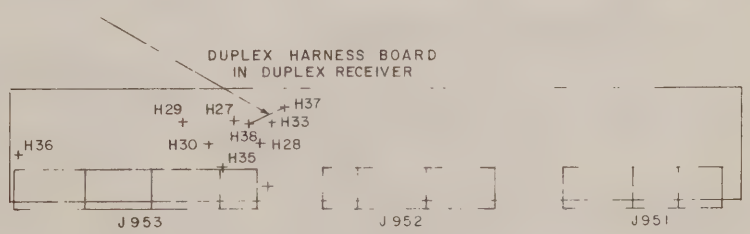
In Channel Guard applications, a jumper between H71 and H72 on the System Board is removed.

Centralized metering jack J905 is provided for use with General Electric Test Set 4EX3A11 or Test Kit 4EX8K12. The red metering plug provides continuous access to the regulated 10 Volts, A+, transmitter and receiver audio, and PTT.

The black metering plug on the Test Set is used for metering the transmitter.



PT NO	DESCRIPTION
1	PUBLIC ADDRESS
2	FIXED SQUELCH
3	NOISE BLANKER DISABLE
4	CARRIER CONTROL TIMER



(19C320634, Rev. 10)

Figure 1 - System Board Options and Modifications

CIRCUIT ANALYSIS

10-VOLT REGULATOR IC

The 10-Volt Regulator IC contains the following circuits:

- 10-Volt Regulator Reference Amplifiers
- Compensation Voltage Divider
- Receiver Muting and Delay
- Transmitter Keying and Delay
- Receiver Oscillator Control
- Transmitter Disable

A typical regulator IC is shown in Figure 2.

10-Volt Regulator

The 10-Volt regulator includes regulator amplifiers Q1 and Q2 (in the IC), and regulator pass transistor Q901. Q901 is mounted on the side of the front casting which acts as a heatsink for the transistor. The regulator circuit provides a closely-controlled supply voltage for the transmitter exciter and receiver (except for the audio PA), and for Channel Guard and Carrier Control Timer options when present. Input voltage (A+) is supplied from the Control Unit on J901-29.

Turning on the radio applies voltage (A+) through input filter L901, C901 and C902 to pin 1 of the regulator and to the base of Q1, causing it to conduct. This turns on PNP regulator pass transistor Q901 and an output voltage appears at the collector. When the output voltage (at pin 3) reaches 10 Volts, zener diode VR1 breaks down, and Q2 starts conducting.

If the output voltage starts to increase, the base current of Q2 also increases, causing it to conduct harder. This causes Q1 to conduct less, decreasing the forward bias on Q901. The voltage drop across Q901 increases and the output remains constant.

When the input voltage starts to drop, the output voltage also tends to drop, causing Q2 to conduct less. This allows Q1 to conduct harder, increasing the forward bias on Q901 and causing it to conduct harder. This reduces the voltage drop across Q901 to keep the output constant.

Service Note: The 10-Volt regulator is protected against short circuits. When supply voltage is present but there is no 10-Volt output, the trouble is probably not in the 10-Volt regulator. Always check for a short (or high drain) on the 10-Volt line

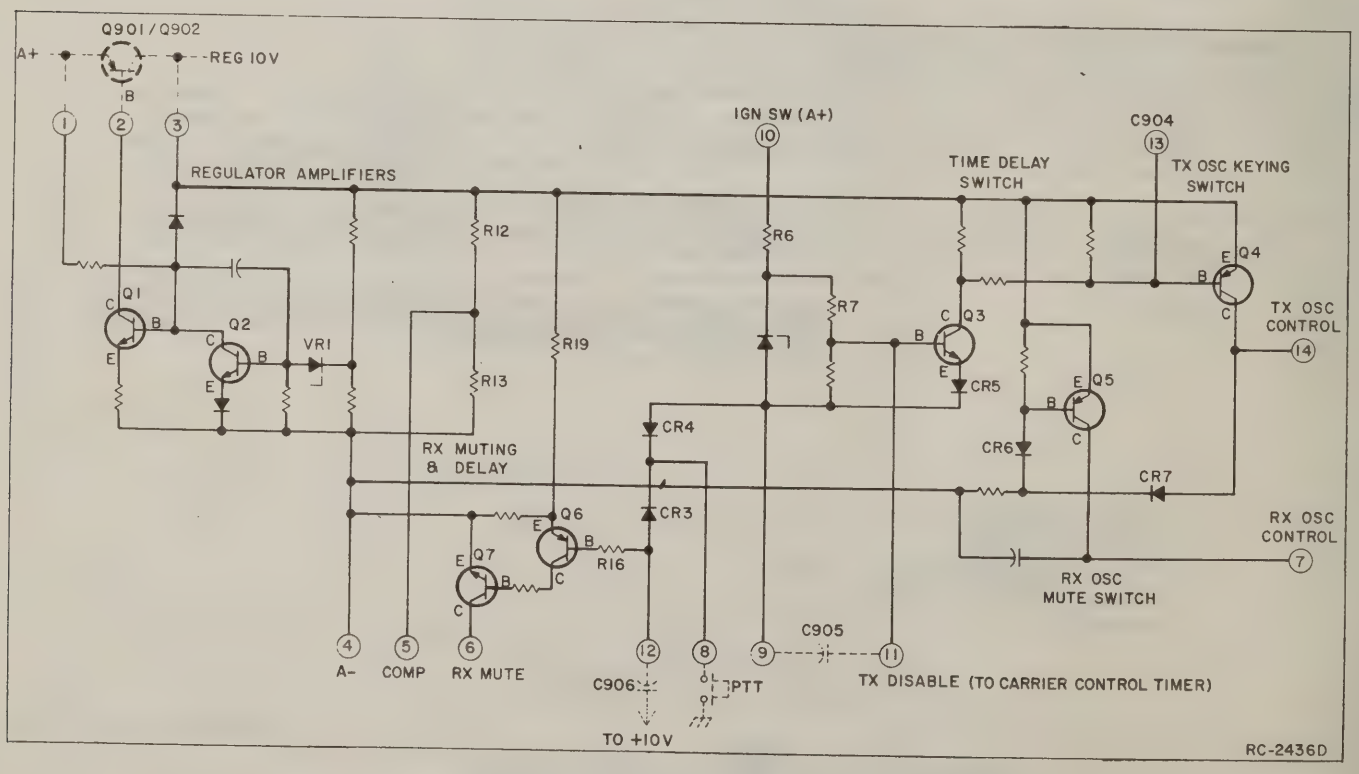


Figure 2 - Typical Regulator IC

before replacing the regulator (see Troubleshooting Procedure.)

Compensation Voltage Divider

When the regulator is turned on, the 10-Volt output is applied to a voltage divider network consisting of R12 and R13. This high impedance source provides a stable 5-Volt compensation input (at pin 5) to the transmitter and receiver ICOMs. This source must not be used for any other purpose.

Receiver Muting & Delay

Pressing the PTT switch grounds the base of Q6 in the receiver muting and delay circuit, turning it on. Turning on Q6 turns on Q7, causing its collector to drop to A-. The A- at pin 6 is applied to the receiver squelch and audio ICs, muting the receiver.

With the PTT switch pressed, C906 starts to charge from the +10-Volt line. When the PTT switch is released, C906 keeps Q6 and Q7 on for approximately 50 milliseconds as the capacitor discharges through R19, the emitter-base junction of Q6, and R16. This delays the turn-on of the receiver audio for 50 milliseconds.

NOTE

In duplex applications cut the jumper or printed wire run between H95 and H96 on the bottom of system board. This prevents receiver muting when the transmitter is keyed.

Transmitter Keying & Delay

Pressing the PTT switch on the microphone connects pin 8 of the regulator IC to A-. Capacitor C905 starts to charge through R6 and R7. In 15 milliseconds, C905 is charged to a voltage high enough to allow time delay switch Q3 to turn on. This causes transmitter oscillator control switch Q4 to turn on. Turning on Q4 applies voltage to the transmitter ICOM(s), keying the transmitter. Keying the transmitter ICOM is the only keying control function in the transmitter. The collector voltage of Q4 also reverse biases CR6, turning off Q5 and removing the supply voltage to the receiver ICOM(s).

The 15 millisecond time delay in the transmitter oscillator keying circuit allows the antenna switch to energize before RF is applied to the antenna switch. When the PTT is released, diode CR901 delays the antenna switch from de-energizing until the RF is removed from the contacts.

Receiver Oscillator Control

When the radio is in the receive mode (transmitter unkeyed), transmitter oscillator control switch Q4 is off and receiver oscillator control switch Q5 is conducting. The voltage at the collector of Q5 is applied to the receiver ICOM(s).

Transmitter Disable

In radios equipped with a Carrier Control Timer, pin 11 connects to P907-1 (TX DISABLE) on the Carrier Control Timer plug. When the timing cycle on the Carrier Control Timer runs out, A- is applied to pin 11, turning off the transmitter oscillator control voltage which turns off the transmitter.

REPEATING ICOMS

A matrix on the bottom of the System Board can be modified to permit both the transmitter and receiver to repeat the use of the same frequency without the use of additional ICOMs. This can be done by simply cutting frequency selection runs on the System Board, adding isolation diodes across the cut runs, and then connecting the repeated channels together with a jumper. With this modification, the frequency selector switch will have the same transmitter or receiver frequency on one or more switch positions as desired, using only one ICOM for each of the repeated channels. A simplified example of the System Board modified for repeating ICOMs is shown in Figure 3. For more detailed information and for instructions for modifying Dual Front Ends, refer to the Modification Instructions for Repeating ICOMs (see Table of Contents).

For example, to repeat transmitter channels F1, F3, F5 and F7:

1. Cut the runs between H2 and H3, H16 and H17, H30 and H31, and H44 and H45.
2. Connect a diode (cathode end towards the frequency select lead) across each of the cut runs.
3. Connect a #26 AWG sleeved jumper from H4 to H18, H18 to H32 & H32 to H46.

To repeat receiver channels F3, F6 and F8:

1. Cut the runs between H19 and H20, H40 and H41, and H54 and H55.
2. Connect a diode (cathode end towards the frequency select lead) across each of the cut runs.
3. Connect a #26 AWG sleeved lead from H21 to H42, and from H42 to H56.

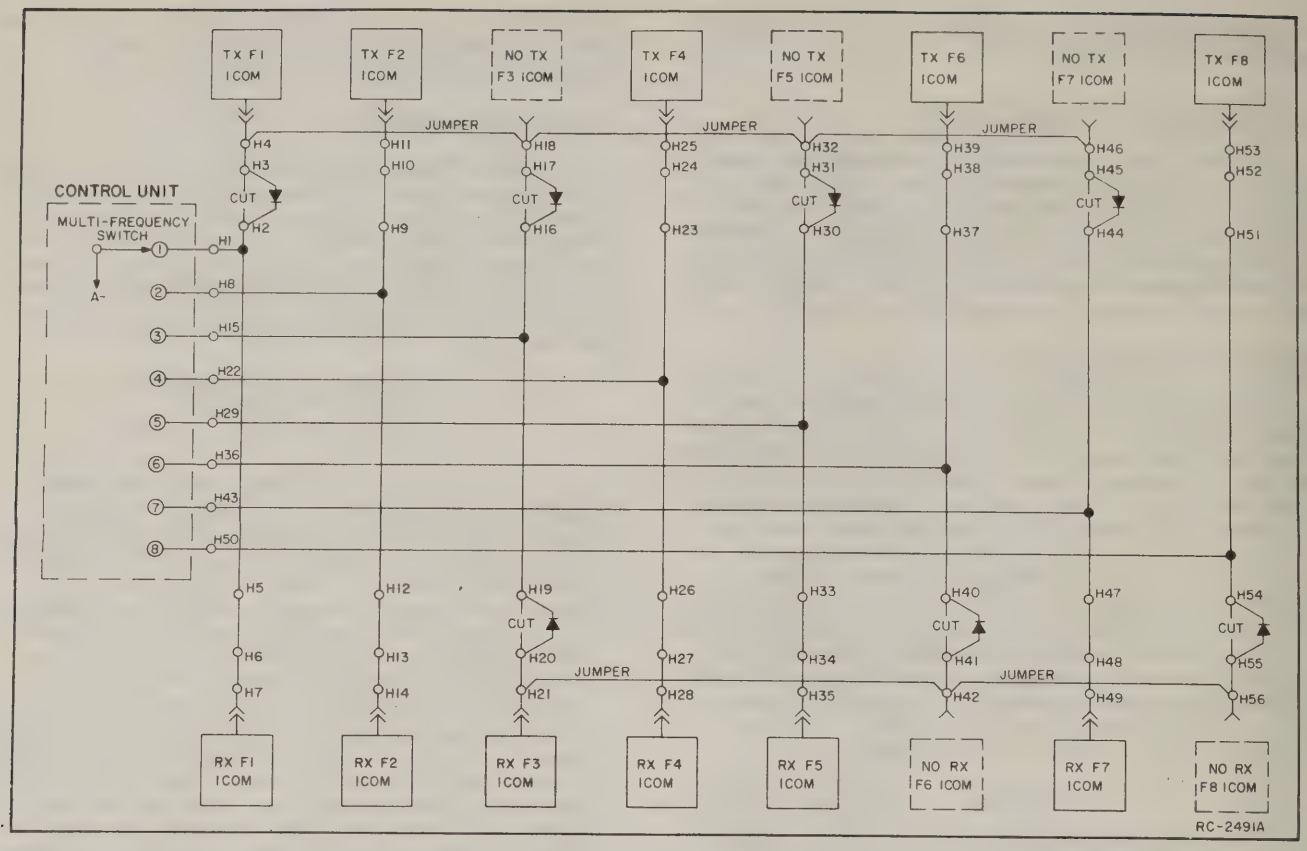


Figure 3 - Repeating ICOMs

MAINTENANCE

DISASSEMBLY

To service the System Board from the top (see Mechanical Parts Breakdown):

1. Pull the locking handle down, then pry up the top cover at the front notch and lift off the cover.

To service the board from the bottom:

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Remove the top cover, then loosen the two bottom cover retaining screws and remove the bottom cover.

To remove the System Board from the radio:

1. Remove the top and bottom covers.
2. Disconnect the receiver antenna input plug (A), and the exciter output plug (B). (see Figure 4).
3. Remove the five screws (C) holding the receiver RF assembly to the module mounting frame. Then remove the two screws (D) holding the receiver audio PA heatsink to the right side rail.
4. Remove the five screws (E) holding the receiver boards to the module mounting frame (see Figure 5).
5. Remove the six screws (F) holding the exciter board and its bottom cover to the module mounting frame.
6. Press straight down on the plug-in Exciter and then the Osc/Mult and IFAS boards to avoid bending the pins when unplugging the boards from the System Board Jacks.
7. In "M" Model radios, remove the four screws (G) in each of the side rails and remove the side rails (see Figure 4). In "E" Model radios, remove the seven screws in the side rails, and remove the side rails. Unsolder any leads to the System Board if desired. NOTE: Remove the shield on the left side rail to expose the power cables, and if desired, unsolder the cables from the bottom of the PA Assembly.
8. Disconnect the PTT leads from J910 on the System Board, and the antenna plug from the PA assembly.
9. If it is necessary to remove the System Board from the front casting, remove the mounting screw (H) from regulator transister Q901. Then remove six screws (J) (three along the top and three along the bottom) on System jack J901 and remove the System Board.

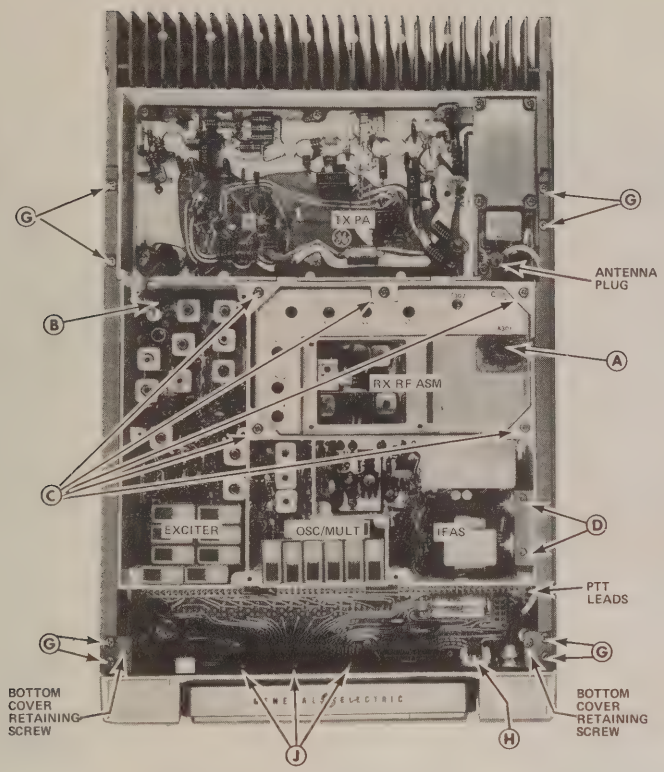


Figure 4 - Disassembly Procedure (Top View)

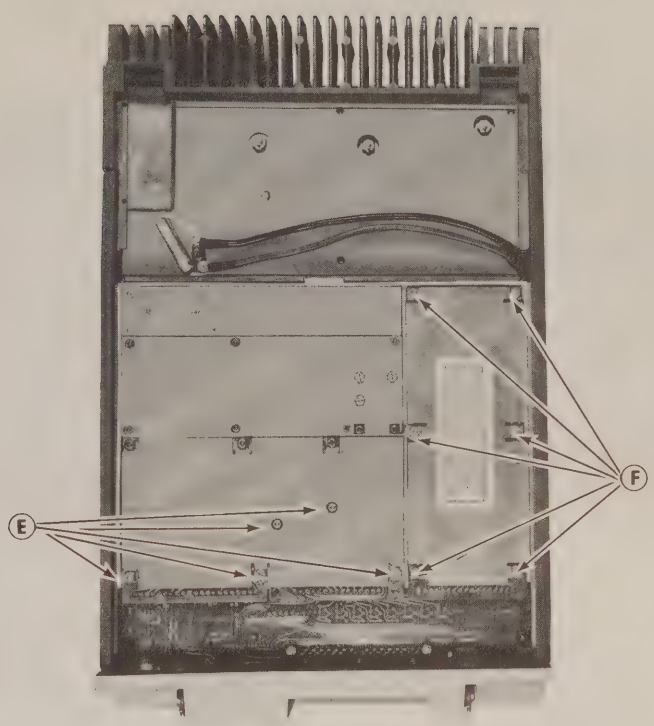
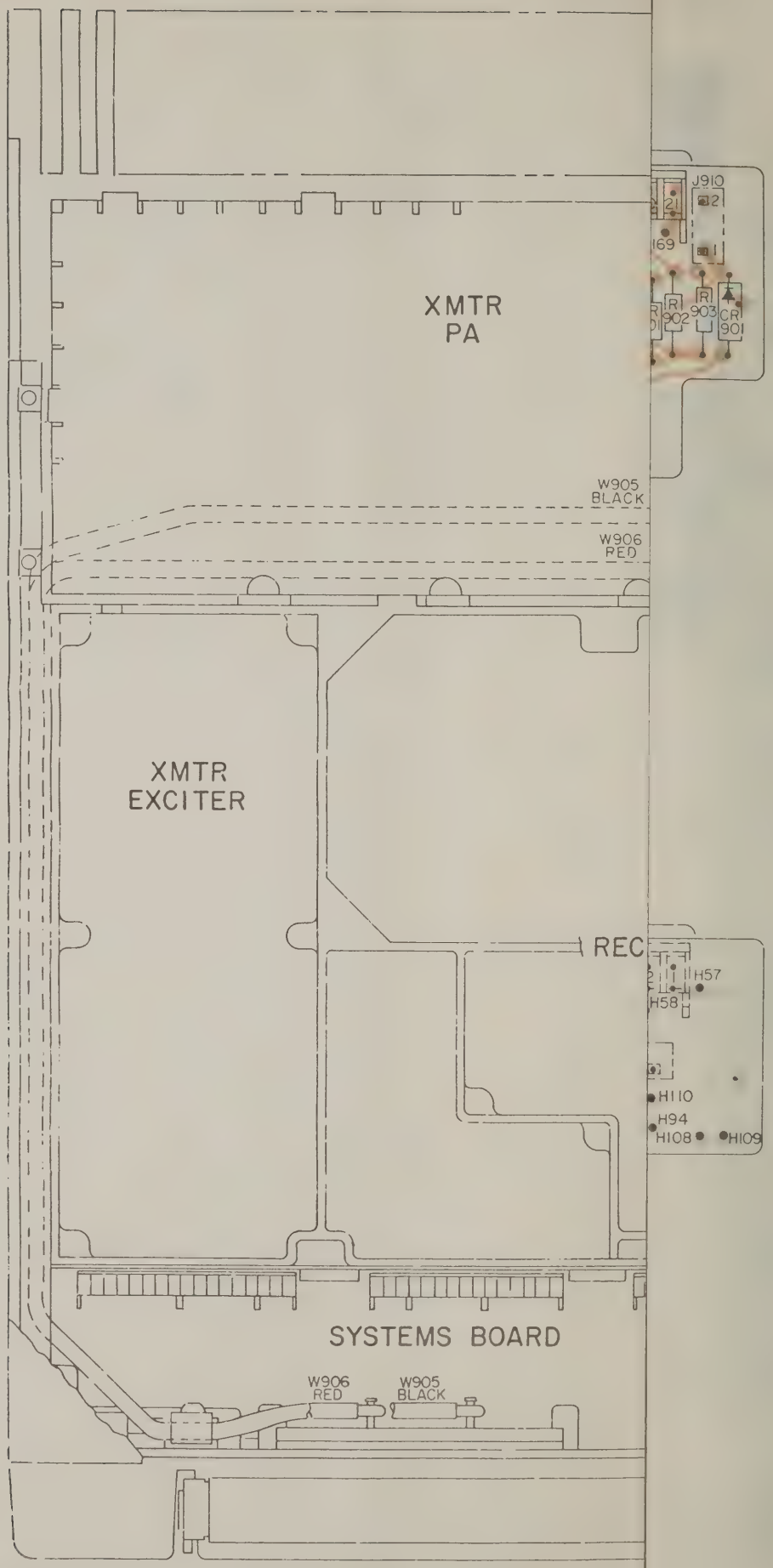


Figure 5 - Disassembly Procedure (Bottom View)

TROUBLESHOOTING

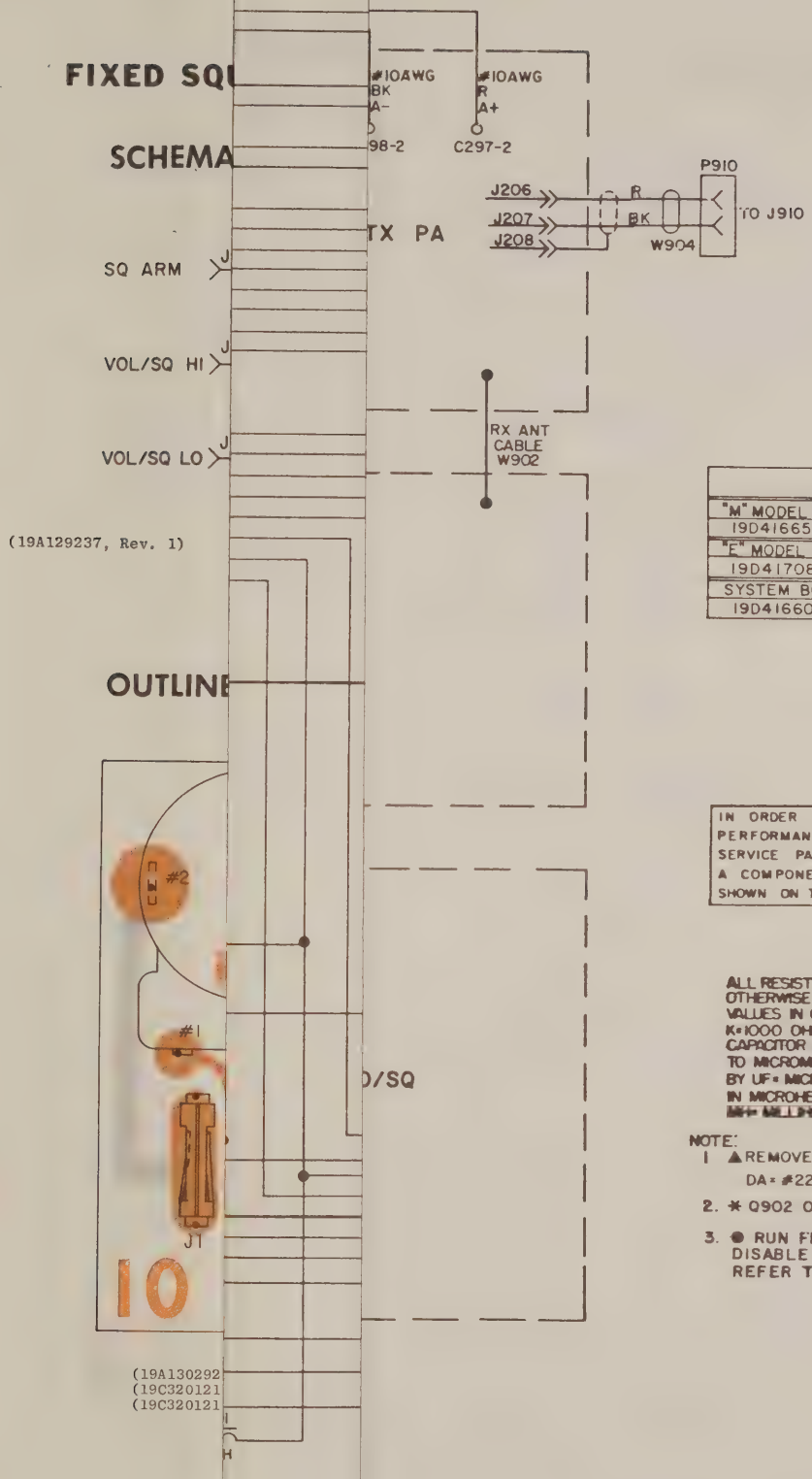
10-VOLT REGULATOR U901

SYMPTON	PROCEDURE
No 10-Volt output	1. Check input voltage (A+) at pin 1 of U901. 2. Remove the Power/Control cable from J901. Check for shorts from Pins 3, 7 and 14 to A-. These readings should be no less than 100 ohms. 3. Check Pass transistor Q901. 4. Replace U901.
Regulator output too high	1. Check Q901. 2. Replace U901.
No switched 10-Volts for transmitter or receiver	1. Check for shorts from Pins 7 and 14 to A-. 2. Check to see that Pin 8 of U901 goes to A- when PTT switch is pressed. 3. Replace U901.



OUTLINE DIAGRAM

FRONT PANEL & SYSTEM BOARD



	REV LETTER
"M" MODEL FRONT PANEL	
19D416653G1	B
"E" MODEL FRONT PANEL	
19D417084G1	B
SYSTEM BOARD	
19D416602G1	G

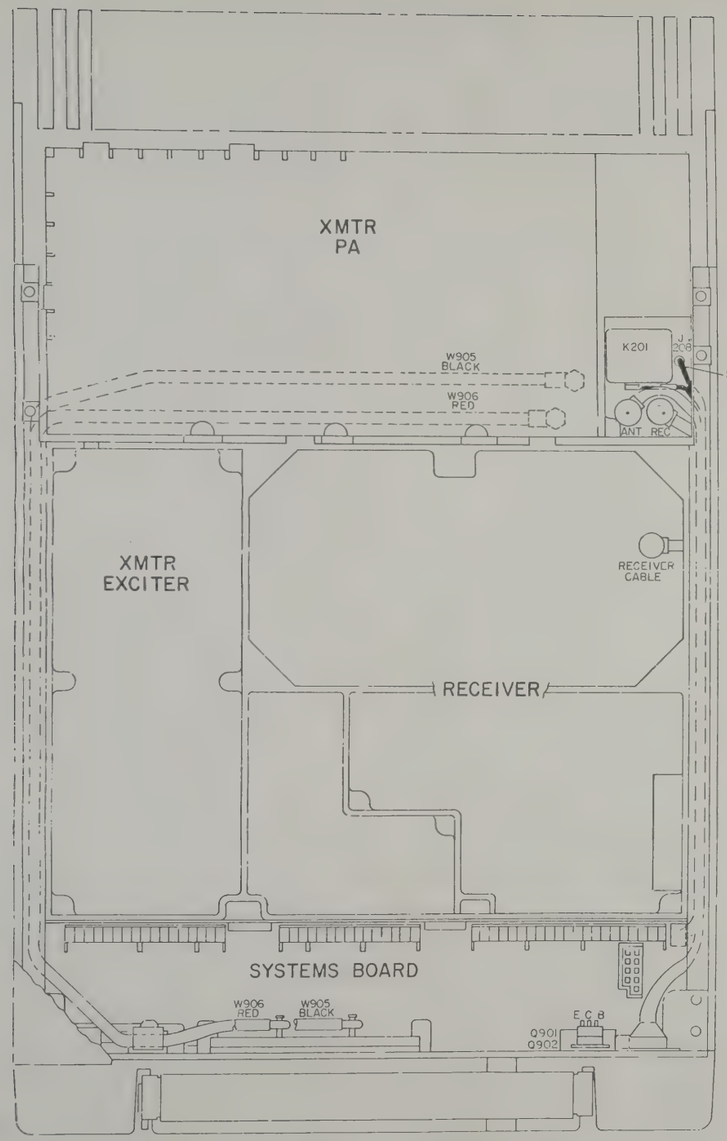
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

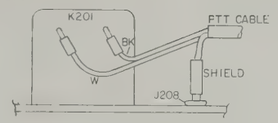
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

NOTE:
1. ▲REMOVE FOR CHANNEL GUARD.
   DA=#22 AWG WIRE SIZE.
2. * Q902 ON 19D417084G1 ONLY.
3. ● RUN FROM H95 TO H96 IS REMOVED TO DISABLE RX MUTE FOR DUPLEX OPERATION REFER TO DUPLEX INTERCONNECTION DIAGRAM

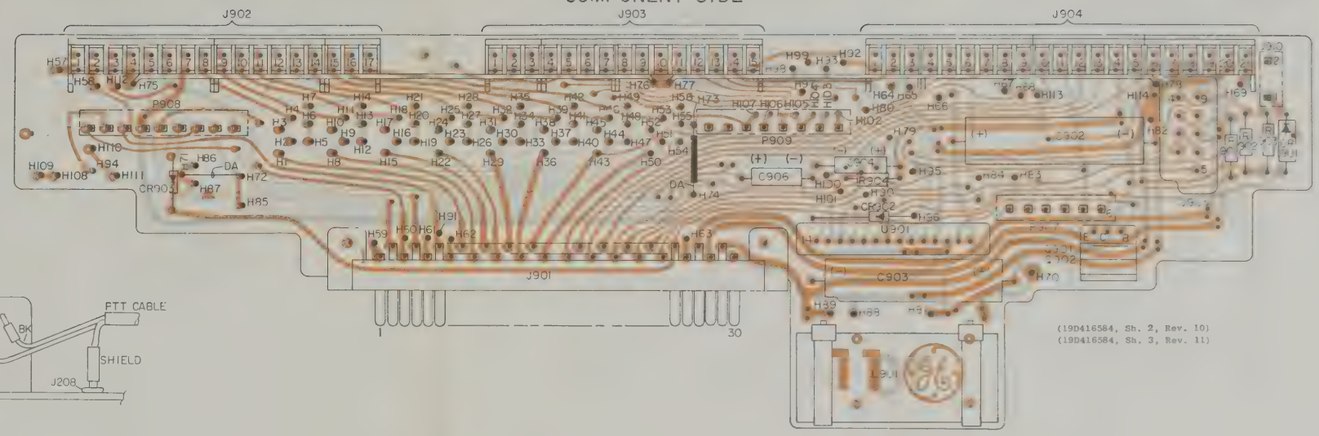
SCHEMATIC DIAGRAM

FRONT PANEL & SYSTEM BOARD



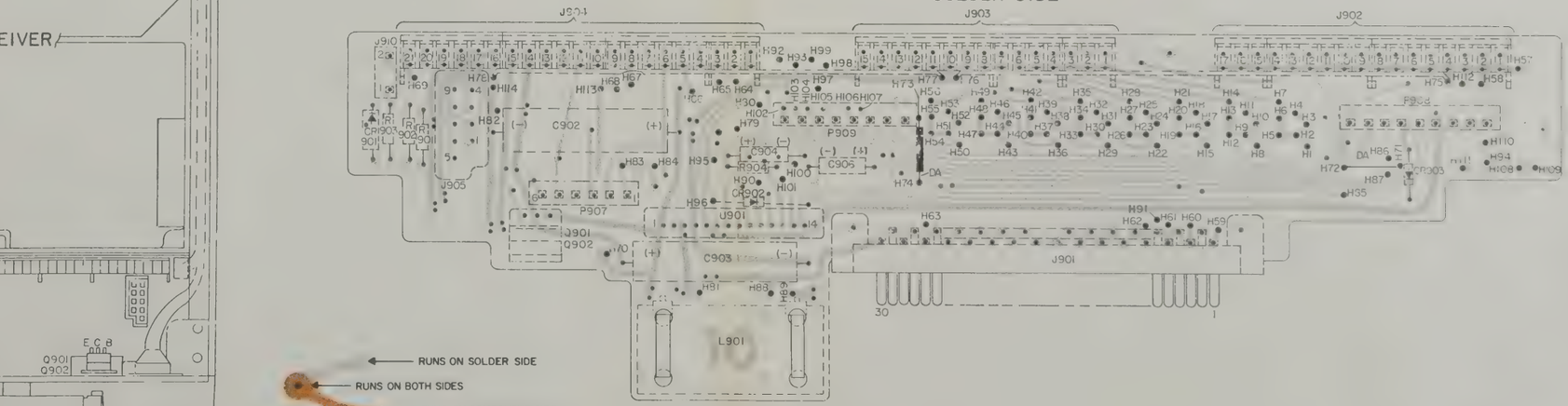


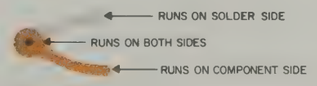
SYSTEMS BOARD
COMPONENT SIDE



(19D416584, Sh. 2, Rev. 10)
(19D416584, Sh. 3, Rev. 11)

SOLDER SIDE





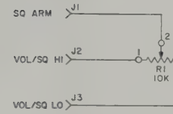
(19R622009, Rev. 13)

OUTLINE DIAGRAM

FRONT PANEL & SYSTEM BOARD

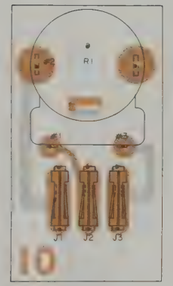
FIXED SQUELCH OPTION

SCHEMATIC DIAGRAM



(19A129237, Rev. 1)

OUTLINE DIAGRAM



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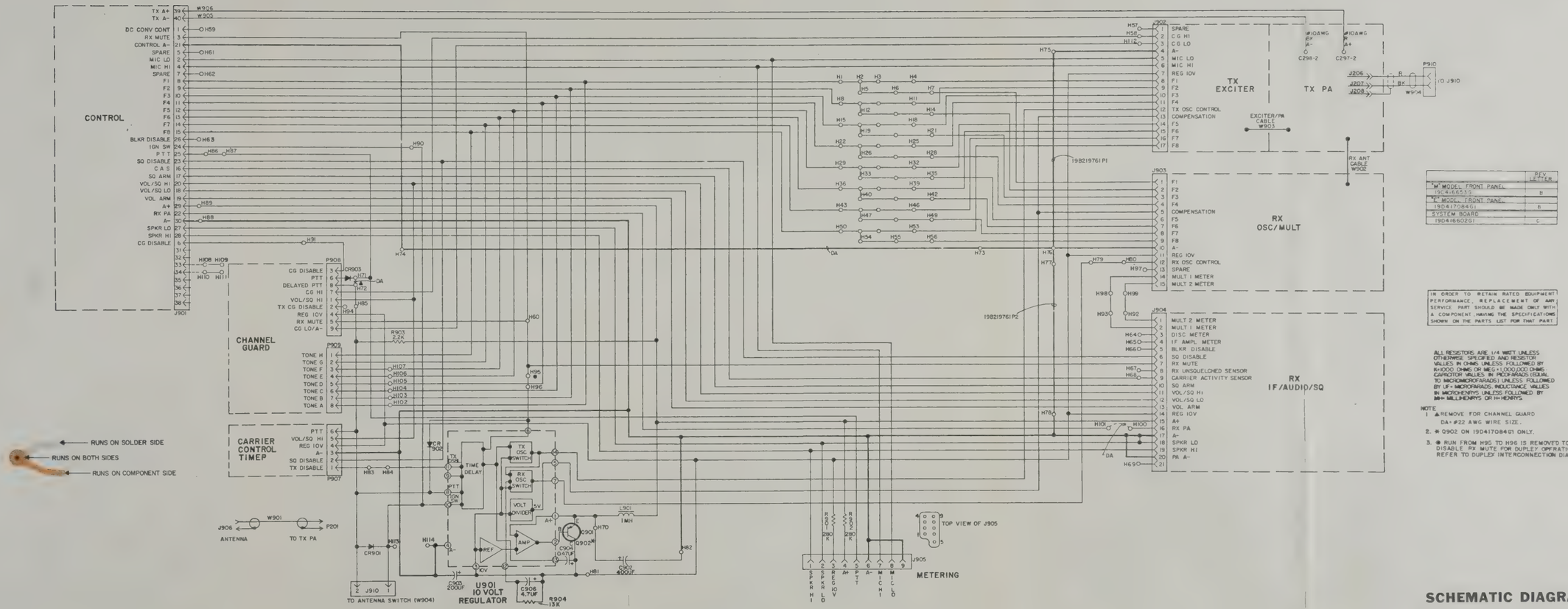
(19C320121, Sh. 2, Rev. 1)
(19C320121, Sh. 3, Rev. 1)



(19K621808, Rev. 21)

	REV LETTER
M MODEL FRONT PANEL 19D416653G	B
C MODEL FRONT PANEL 19D417084G	B
SYSTEM BOARD 19D416602G	C

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

NOTE
1. ▲REMOVE FOR CHANNEL GUARD DA= #22 AWG WIRE SIZE.
2. ◆ Q902 ON 19D417084G1 ONLY.
3. ● RUN FROM H95 TO H96 IS REMOVED TO DISABLE RX MUTE FOR DUPLEX OPERATION. REFER TO DUPLEX INTERCONNECTION DIAGRAM

SCHEMATIC DIAGRAM

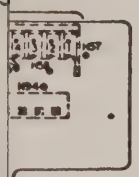
FRONT PANEL & SYSTEM BOARD

PUR

STR II

REQ

INS

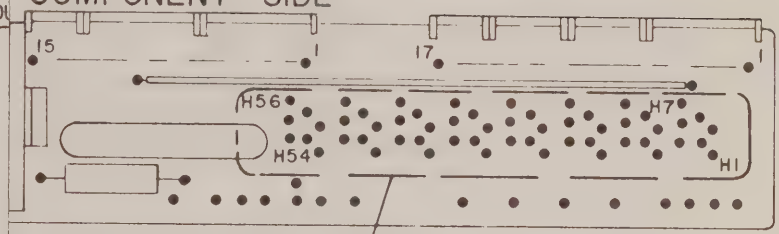


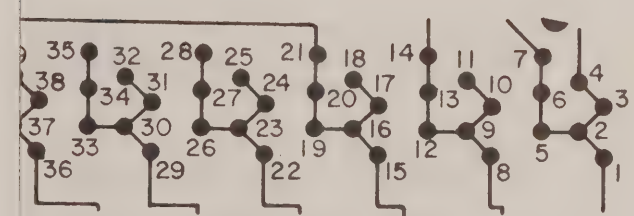
DETAIL 'A'

"A" FREQUENCY
F1
F2
F3
F4
F5
F6
F7
F8

7. Sh. 2. Rev. 1)

DIODE STRAPPING, MASTR II

2ND SYSTEM BOARD
COMPONENT SIDE

SEE DETAIL "B"



DETAIL "B"

PARTS LIST

LBI4749F

FRONT PANEL AND SYSTEM BOARD
19D416653G1 "M" SERIES
19D417084G1 "E" SERIES
19D417084G2 "E" SERIES DCPLEX

SYMBOL	GE PART NO.	DESCRIPTION
		- - -

PAGE 1 - MODIFICATION INSTRUCTIONS

PURPOSE: THIS MODIFICATION IS APPLIED TO MASTR II (M OR E MOBILES WITH NO MAJOR OPTIONS) COMBINATIONS WHICH REQUIRE DIODE STRAPPING * (PER CUSTOMER REQUEST) FOR COMMON FREQUENCY POSITIONS (RX OR TX) TO ELIMINATE REPEATING ICOM'S OR BLANK FREQUENCY SELECT SWITCH POSITIONS. TO APPLY WITH MAJOR OPTIONS, SEE PAGE 2.

REQUIRED PARTS: A TOOL TO CUT PWB RUNS (KNIFE OR ROTARY GRINDER) DM WIRE, SLEEVING, 19A115250P1 DIODES.

INSTALLATION: REMOVE THE TOP AND BOTTOM COVERS OF THE RADIO. ON THE SYSTEM BOARD (19D416602 IS PART OF THE FRONT PANEL ASSEMBLY 19D416653). PERFORM THE FOLLOWING FUNCTIONS:

1. SELECT COMMON FREQUENCY POSITIONS (THOSE TO BE COMBINED) FROM COLUMN "A" BELOW.
2. CUT CORRESPONDING RUNS FROM COLUMN "B" REPLACING EACH CUT RUN WITH A DIODE.
3. CONNECT COMMON FREQUENCIES TOGETHER WITH DM WIRE JUMPERS (SLEEVED) PER COLUMN "C".
4. TEST TRANSMIT AND RECEIVE DIODE CONNECTIONS SEPARATELY. CHECK FOR CONTINUITY BETWEEN ANODES. CHECK FOR OPEN CIRCUIT BETWEEN CATHODES WITH BOTH POLARITIES OF THE METER.
5. REPLACE COVERS

NOTE: ICOM WILL OPERATE IN ANY OF THE STRAPPED POSITIONS.

* THIS KIT IS CALLED FOR ON EACH DELETE ICOM OPTION WHICH IS REQUIRED TO DELETE ICOMS FOR REPEATING FREQUENCIES OR FOR UNEVEN TRANSMITT/RECEIVE FREQUENCIES.

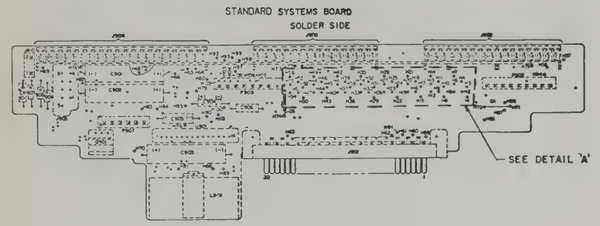
TRANSMITTER CHART			
"A" FREQUENCY	"B" CUT RUN BETWEEN HOLES BELOW ADD DIODE (CATHODE ◀ ANODE)		"C" ADD DM JUMPER
F1	H2	H3	H4
F2	H9	H10	H11
F3	H16	H17	H18
F4	H23	H24	H25
F5	H30	H31	H32
F6	H37	H38	H39
F7	H44	H45	H46
F8	H51	H52	H53

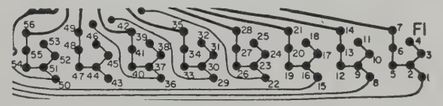
RECEIVER CHART			
"A" FREQUENCY	"B" CUT RUN BETWEEN HOLES BELOW ADD DIODE (CATHODE ◀ ANODE)		"C" ADD DM JUMPER
F1	H5	H6	H7
F2	H12	H13	H14
F3	H19	H20	H21
F4	H26	H27	H28
F5	H33	H34	H35
F6	H40	H41	H42
F7	H47	H48	H49
F8	H54	H55	H56

EXAMPLE: TO STRAP RECEIVER F2, F3, AND F6

1. COLUMN A SEE F2, F3, F6
2. CUT RUNS BETWEEN H12-H13, H19-H20, AND H40-H41
3. ADD DIODES BETWEEN H12-H13, H19-H20, AND H40-H41
4. ADD DM JUMPERS BETWEEN H14-H21 AND H21-H42

DIODE STRAPPING, MASTR II





DETAIL 'A'

(19C321247, Sh. 1, Rev. 3)

PAGE 2 - MODIFICATION INSTRUCTIONS

MAJOR OPTIONS

12 FREQUENCY MOBILE

USE INSTRUCTIONS PER PAGE 1 WITH THE EXCEPTION THAT DIODE STRAPPING IS NOT COMPATIBLE WITH F9 THRU F12.

DUPLEX MOBILE

DIODE STRAPPING IS NOT COMPATIBLE.

WIDE SPACED TRANSMITTER - OPTIONS 9203, 9204

USE INSTRUCTIONS PER PAGE 1.

DUAL FRONT END

WHEN THIS MODIFICATION IS USED IN A SYSTEM MOBILE WITH THE D.F.E. (DUAL FRONT END) OPTION (9201 OR 9202) THE APPLICATION IS DIFFERENT. ONLY THE BLANK FREQUENCY POSITIONS IN THE STANDARD RECEIVER & D.F.E. CAN BE STRAPPED. IN OTHER WORDS, SINCE THE RECEIVER AND D.F.E. OSCILLATOR POSITIONS ARE WIRED IN PARALLEL, ANY MODIFICATION WILL AFFECT BOTH ITEMS. THEREFORE, THE DIODE STRAPPING CAN ONLY BE APPLIED TO THE OSCILLATOR POSITIONS WHICH ARE EMPTY IN BOTH THE RECEIVER AND D.F.E. SEE TWO EXAMPLES BELOW. REFER TO PAGE 1 FOR INSTRUCTIONS RETURN UNUSED KITS TO STOCK.

FIRST EXAMPLE: ASSUME DIGIT VI OF THE RADIO COMBINATION NUMBER IS "E" (3 FREQUENCY TX/3 FREQUENCY RX). CUSTOMER WANTS ONLY ONE ICOM IN THE RECEIVER AND TWO ICOM'S IN THE D.F.E. (TOTAL 3). TWO DELETE RECEIVER ICOM OPTIONS (9049 OR 9050) ARE REQUIRED TO DELETE THE TWO UNNECESSARY ICOM'S IN THE RECEIVER. THE TWO ICOM'S IN THE D.F.E. ARE CALLED FOR IN THE D.F.E. COMBINATION NUMBER. THEREFORE, ALL THREE FREQUENCY POSITIONS ARE OCCUPIED, ONE IN THE RECEIVER, TWO IN THE D.F.E., SO NO DIODE STRAPPING IS REQUIRED.

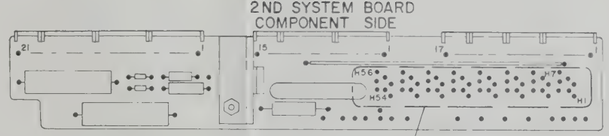
SECOND EXAMPLE: ASSUME DIGIT VI OF THE RADIO COMBINATION NUMBER IS "G" (5 FREQUENCY TX/5 FREQUENCY RX). CUSTOMER WANTS ONLY TWO ICOM'S IN THE RECEIVER AND ONE ICOM IN THE D.F.E. (TOTAL 3). THE REMAINING TWO FREQUENCIES WILL BE PROVIDED BY DIODE STRAPPING. THREE DELETE RECEIVER ICOM OPTIONS (9049 OR 9050) ARE REQUIRED TO DELETE THE THREE UNNECESSARY ICOM'S IN THE RECEIVER. ONLY ONE D.F.E. ICOM IS CALLED FOR WITH THE D.F.E. COMBINATION NUMBER. THEREFORE, ONLY THREE OF THE FIVE AVAILABLE POSITIONS ARE OCCUPIED, REQUIRING STRAPPING TO THE TWO UNUSED POSITIONS. THE CUSTOMER ORDER SHOULD CALL OUT POSITIONS TO STRAP. (FOR EXAMPLE, STRAP FREQUENCY 3 TO POSITION 4, AND FREQUENCY 2 TO POSITION 5). THE RECEIVER JUMPER CHART ON PAGE 1 IS USED AS NORMAL. ONE DIODE KIT WILL BE LEFT OVER.

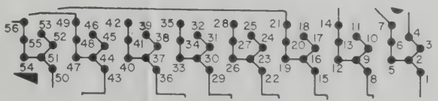
NOTE THAT THIS INSTRUCTION DOES NOT AFFECT THE TRANSMITTER DIODE STRAPPING IN THIS APPLICATION.

WIDE SPACED TRANSMITTER AND DUAL FRONT END - REQUIRES OPTION 9205

FOR STANDARD RECEIVER STRAPPING, USE INSTRUCTIONS ON PAGE 1. DIODE STRAPPING OF THE TRANSMITTER ICOM'S IN THE 1ST (TOP) EXCITER IS NOT COMPATIBLE. FOR 2ND EXCITER AND DUAL FRONT END ICOM'S, DIODE STRAPPING IS PERFORMED ON THE 2ND SYSTEM BOARD 19D417298 PER THE INSTRUCTIONS AND CHARTS ON PAGE 1. THE HOLE LAYOUT FOR STRAPPING ON THE 2ND SYSTEM BOARD IS IDENTICAL TO THE STANDARD SYSTEM BOARD. SEE DETAIL "B".

DIODE STRAPPING, MASTR II





DETAIL "B"

(19C321247 Sh. 2 Rev. 1)

MOBILE RADIO

MAINTENANCE MANUAL

C-500 SERIES

1-FREQUENCY CONTROL UNIT WITH OPTIONS - 19D423590G3

1-THRU 8-FREQUENCY CONTROL UNIT - 19D423590G4

SPECIFICATIONS *

Controls	Power-On Volume Squelch Channel Selector Switch (G4 only) Option Switch Optional Blanker Disable Switch
Indicators	Power On Light Transmit Light Optional Channel Busy Light Option Light

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

DATAFILE FOLDER - DF4105

Maintenance Manual LBI30239G

C-500 SERIES 1-FREQUENCY AND 1-THRU 8-FREQUENCY CONTROL UNITS WITH OPTIONS

DESCRIPTION

C-500 Series Control Units are attractively styled, highly functional units that are enclosed in a two-piece molded Lexan® housing for durability and ease of disassembly. The Control Units are mounted to the vehicle with a Safety Release Lexan® mounting bracket assembly for passenger safety.

The Control Unit uses a printed wiring board to provide a minimum of wiring. The only internal wires used are on the POWER-ON switch, indicator lights and jumpers for various options.

Cable plugs are secured to the back of the Control Unit by plastic locking clips. The plugs are equipped with indexing tabs to assure connection to the correct jack. The cable is equipped with a strain relief hook that attaches to a steel plate on the bottom rear of the Control Unit.

The microphone plug is secured to a jack on the bottom of the unit by means of a captive locking screw.

All indicator lights are light-emitting diodes (LEDs) for reliability, long life, and low power consumption.

In addition to MASTR™ II applications the C500 Control Unit can be used with EXEC II MASTR DELTA and DELTA-S radios providing the correct Power/Control Interface Cable is used.

A binary converter is required with the DELTA-S when it operates on three or more channels or when the radio is equipped with PSLM.

CIRCUIT ANALYSIS

The Control Units are equipped with a VOLUME control, SQUELCH control and a POWER-ON rocker switch. The multifrequency Control Unit is also equipped with a frequency selector switch.

When the POWER-ON switch (S701) is in the OFF position, power is removed from the radio except for the transmitter PA, which is connected to the vehicle battery at all times. Pushing the switch to the ON position applies power to the radio, provides power for the push-to-talk (PTT) circuit and lights the power-on LED in the Power-ON/Frequency Indicator window.

Releasing the PTT switch turns off the transmitter and transmit indicator, de-energizes the antenna switch and unmutes the receiver. Refer to the Table of Contents for a simplified Transmitter Keying and Power Distribution Diagram.

CR701 and CR708 are protective diodes. CR701 will cause the fuse in the yellow lead to blow if the polarity is reversed. CR708 inhibits the PTT circuit if the polarity is reversed.

MULTI-FREQUENCY SWITCH (S703)

The frequency selector switch is a 12-position switch with a mechanical stop that limits rotation from one through eight positions as required.

The frequency selector switch selects the desired channel for both transmitting and receiving. The switch connects A- to the selected transmitter and receiver ICOM so that the radio operates on the selected channel.

DC CONVERTER MODIFICATIONS (MASTR II ONLY)

In radios equipped with the DC converter, the POWER-ON switch is modified so that placing the switch in the ON position

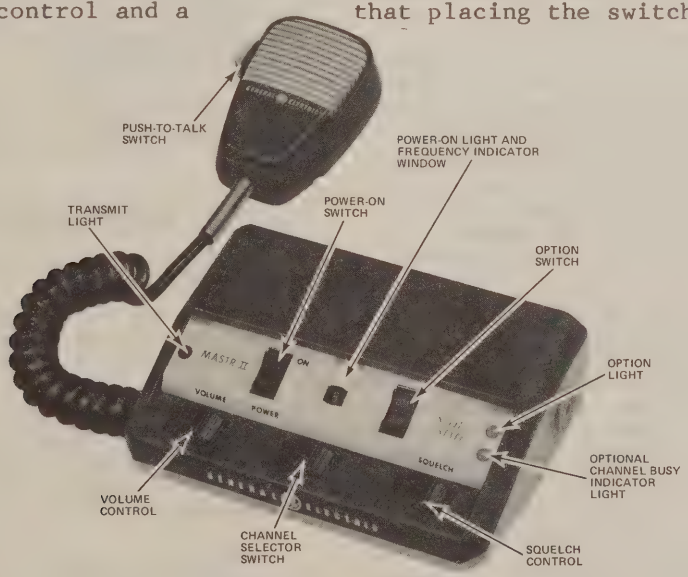


Figure 1 - Control Unit Layout

applies the input voltage directly to the DC converter. Instructions for the modification are shown on the control unit Schematic Diagram.

OPTIONS

MASTR II control units may be equipped with different options. All controls and indicator lights (LEDs) are shown in Figure 1.

Channel Busy Indicator

When no signal is applied to the receiver, the Carrier Activity Sensor (CAS) voltage from the receiver squelch IC is near A-. This forward biases diode CR702 in the control unit, keeping Q701 turned off. When a signal is applied to the receiver (with or without audio), the CAS voltage rises to approximately 10 Volts. This reverse biases CR702, allowing Q701 to conduct, turning on Channel Busy Indicator CR706. The indicator will remain on as long as a signal is applied to the receiver, or until the transmitter is keyed.

Noise Blanker Disable Switch (MASTR II only)

Noise Blanker Disable switch S1 mounts on the back of the control unit (see Outline Diagram). Placing the switch in the "OFF" position applies A- to the blanker disable lead. The A- is connected to pin 4 of the receiver blanker IC (U551), disabling the noise blanker circuit. The A- is connected to the blanker disable circuit by a jumper from H63 to H66 on the system board (see Front Panel & System Board Maintenance Manual).

Placing the switch in the "ON" position removes the A- to pin 4 of the blanker IC, allowing the blanker to operate.

Fixed Squelch

In radios with the Fixed Squelch option, a two-position rotary switch replaces the standard variable squelch potentiometer. A squelch potentiometer is then mounted on J904 on the system board (see Front Panel & System Board Maintenance Manual).

Turning the optional squelch switch on the Control Unit to the right applies A- to the squelch disable lead. The A- is connected to pin 2 of the receiver audio IC (U604), disabling the squelch circuit (and Channel Guard if present). Turning the switch to the left removes the A- to Pin 2 of the squelch IC, enabling the squelch circuit (and Channel Guard).

Internal/External Speaker

For radios equipped with the Internal/External Speaker option, the control unit will be equipped with optional SPEAKER switch (marked INT-EXT), an Option indicator light and an Internal/External Speaker component board. The radio also has an external speaker mounted outside the vehicle passenger compartment (on the roof, under the hood, etc).

With the switch in the INT (Internal) position, all of the messages received will be heard on the speaker mounted in the vehicle.

Placing the switch in the EXT (External) position turns on the option light, and applies all received messages to both the external and internal speaker. This allows the received messages to be heard while the operator is inside or outside of the vehicle.

For complete details, refer to the Maintenance Manual for the Internal/External Speaker option.

Public Address (MASTR II only)

With the Public Address option, the control unit will be equipped with an optional PA-ON switch, an Option indicator light, and a Public Address component board. The vehicle will also have an additional speaker mounted outside of the passenger compartment.

With the PA switch in the "OFF" position, the operator can send and receive messages as he normally does. Placing the PA switch in the ON position lights the Option light, disables the transmitter, and switches the receiver audio output to the external speaker.

Pressing the PTT switch on the microphone switches the microphone output through the receiver audio amplifier circuit so that the amplified message is heard on the external speaker only. No messages can be transmitted in this mode of operation, and all incoming messages will be heard on the external speaker.

For complete details, refer to the Maintenance Manual for the Public Address option.

Priority Search-Lock Monitor

For radios equipped with Priority Search-Lock Monitor, (PSLM), the control unit will be equipped with a SEARCH-ON switch, a Channel Busy light, and a PSLM board.

With the SEARCH switch in the ON position, the PSLM provides two channel monitoring (depending on the PSLM option used) by alternately sampling a priority channel and then a non-priority channel.

When a signal is received on the priority channel, the PSLM stops searching and locks on the priority channel for the duration of the message. When a signal is

first received on the non-priority channel, the PSLM stops on that channel while monitoring the priority channel. If a signal is received on the priority channel while the PSLM is stopped on the non-priority channel, the PSLM reverts to the priority channel and locks on that channel for the duration of the message.

NOTE

The PSLM will operate only when the receiver is squelched. When the receiver is unsquelched, the PSLM will lock on the first channel that receives a message.

The Channel Busy light will glow steadily whenever a message is received on the priority channel. When a message is received on a non-priority channel, the Channel Busy light will flash on and off. Keying the transmitter turns on the red Transmit light, and turns off the Channel Busy light.

Placing the SEARCH switch in the "OFF" position disables the PSLM circuit, and messages can be sent and received only on the channel selected by the frequency selector switch.

For complete details, refer to the Maintenance Manual for the Priority Search-Lock Monitor option.

Squelch Operated Relay

In radios equipped with the Squelch Operated Relay option, the control unit will be equipped with an OPTION-ON switch, an Option light and a Squelch Operated Relay component board.

When the switch is in the ON position, the relay will energize and the Option light will turn on each time a message is received (receiver unsquelches). The relay will remain locked up and the Option light will remain on until the OPTION switch is turned "OFF". The relay can be connected to turn on a light, operate an alarm or perform other functions as desired.

For complete details, refer to the Maintenance Manual for the Squelch Operated Relay option.

Type 99 Tone Decoders

Type 99 Tone equipment eliminates reception of unwanted calls through the use of a Sequential Tone Decoder. The equipment provides individual or group call capability using either two or four Versatone networks. (Versatone networks determine the tone frequencies that the unit responds to.

Decoder operation is controlled by the Monitor/Reset switch and/or Hookswitch. When the microphone or handset is removed from the hookswitch, the decoder is deactivated and the receiver reverts to noise squelch operation. Replacing the microphone or handset automatically resets the receiver to respond to only those calls properly tone coded. A Decoder Call Indicator will light each time a properly coded call is received.

An optional external alarm relay is controlled by the two position Option-ON switch. When a properly tone coded call is received and the Option switch is in the ON position, the relay will operate an external horn or light.

For complete details, refer to the Maintenance Manual for the Type 99 Tone Decoder option.

Type 90 Tone Encoder and Decoders

Type 90 Tone equipment provides tone coded message transmission to eliminate reception of unwanted calls. All Type 90 Tone Encoders and Decoders operate on a single tone selectable from ten standard frequencies between 1000 and 3000 Hz.

A single tone burst automatically preceeds the first transmission in the standard unit. The tone burst is initiated by removing the microphone or handset from the hookswitch and keying the PTT. The Pushbutton Tone-On switch allows the tone to be sent manually if desired.

Decoder operation is controlled by the Monitor/Reset switch and/or Hookswitch. When the microphone or handset is removed, the receiver reverts to noise squelch operation. Replacing the microphone or handset, automatically resets the unit to the decode function. A Decoder Call Indicator will light each time a properly tone coded call is received.

An optional External Alarm Relay is controlled by the Two Position Option-ON switch. When a properly tone coded call is received and the Option-ON switch is in the ON position, the Relay will operate an external horn or light.

For complete details, refer to the Maintenance Manual for the Type 90 Tone Encoder/Decoder option.

Dual Control

The Dual Control equipment allows the radio to be operated by either of two remotely located control units. Control is transferred between control units by depressing the Control switch on the control unit where control is desired.

When the Control switch is depressed, the Control Light indicates the unit with control. Control remains with this unit until the Dual Control switch on the second control unit is operated.

For complete details, refer to the Maintenance Manual for the Dual Control option.

Universal Tone Jack

The Universal Tone Jack (J750) mounts on the back of the control unit (see Outline Diagram). The nine pin jack provides interface connections between the control unit and external tone equipment.

Extender Board

Troubleshooting the component board options in the control unit is facilitated by using Extender Board 19C320588G1 (Option 9029). The Extender Board provides feed throughs for all connections between the control unit printed wire board and the option component board.

12-VOLT IGNITION SWITCH CONNECTIONS

In 12-Volt vehicle systems, the Control Unit may be connected for two different modes of operation, depending on the way the ignition switch cables are connected in the vehicle system. The black cable provides the system ground connection. The yellow fused lead provides the receiver hot connections and the transmitter Push-To-Talk hot connection. The two types of operation are:

1. Ignition Switch Control - For ignition switch control, the yellow fused lead connects to the ACCESSORY or ON terminal of the ignition switch. The transmitter and receiver will operate only when the ignition switch is in the ACCESSORY or ON position. Turning the ignition switch OFF removes all power to the Control Unit.

2. Ignition Switch Bypass - For ignition switch bypass, the yellow fused lead connects to the "hot" side of the ignition switch or the vehicle fuse block assembly. Both the transmitter and receiver operate independently of the ignition switch and are turned on and off only by the POWER-ON switch on the Control Unit.

DC CONVERTER CONNECTIONS (MASTR II ONLY)

For combinations equipped with the DC converter, a single red fused lead is used. The fused lead always connects to battery plus in either positive or negative ground systems.

CAUTION

When using the DC Converter, do not connect battery ground to the Control Unit A-. To do so may cause failure of the current limiting circuit in the converter.

MAINTENANCE

DISASSEMBLY

To gain access to the inside of the Control Unit, simply remove the two screws on the bottom of the front edge of the unit, and lift off the top cover.

To remove the printed wiring board from the control unit housing:

1. Remove the two screws holding the microphone jack.

2. Remove the screw between J701 and J702 and remove the screw between J702 and J703.

3. Remove the screw at each end of the switch and control mounting bracket.

4. Remove the screw holding Power-On switch S701 to the bottom housing. Then swing the printed wiring board up from the front and lift the board out.

RE-INSTALLATION

12-Volt Systems. MASTR II mobile combinations can operate in ±12-Volt systems. EXEC II mobile combinations operate in ±12-Volt (negative ground) systems only. If the radio is moved to a different vehicle, always check the battery polarity and voltage of the new system before using the radio.

If the radio is moved to a vehicle with different battery polarity, it will be necessary to change the ignition switch leads to the vehicle system plug (MASTR II only). Use the extraction tool as shown in Figure 2, and change the leads as shown in Figures 3 or 4 as required.

DC Converter Systems (MASTR II only)

For radios equipped with the DC Converter, no changes are required in the lead to the vehicle system plug.

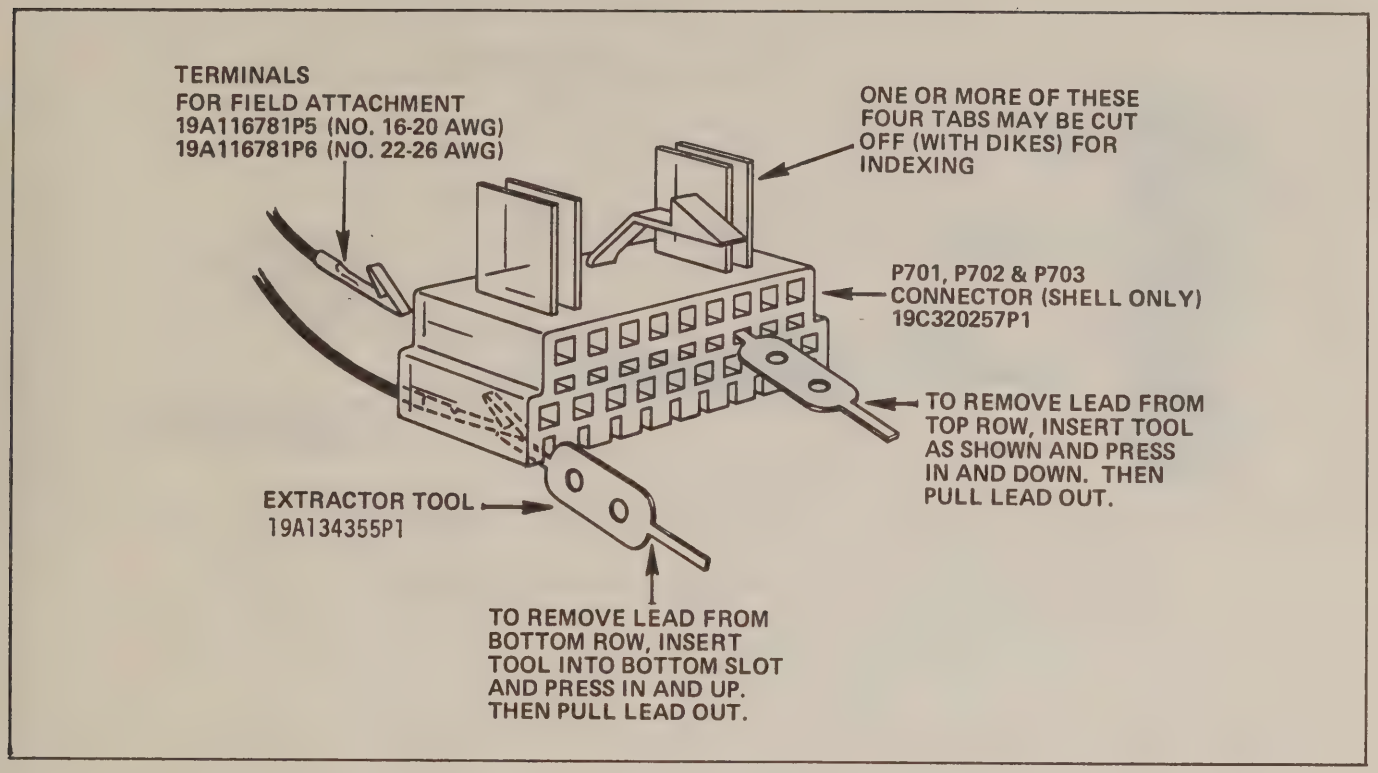

TERMINALS
FOR FIELD ATTACHMENT
19A116781P5 (NO. 16-20 AWG)
19A116781P6 (NO. 22-26 AWG)
ONE OR MORE OF THESE FOUR TABS MAY BE CUT OFF (WITH DIKES) FOR INDEXING
P701, P702 & P703 CONNECTOR (SHELL ONLY) 19C320257P1
TO REMOVE LEAD FROM TOP ROW, INSERT TOOL AS SHOWN AND PRESS IN AND DOWN. THEN PULL LEAD OUT.
EXTRACTOR TOOL 19A134355P1
TO REMOVE LEAD FROM BOTTOM ROW, INSERT TOOL INTO BOTTOM SLOT AND PRESS IN AND UP. THEN PULL LEAD OUT.

Figure 2 - Using Extraction Tool

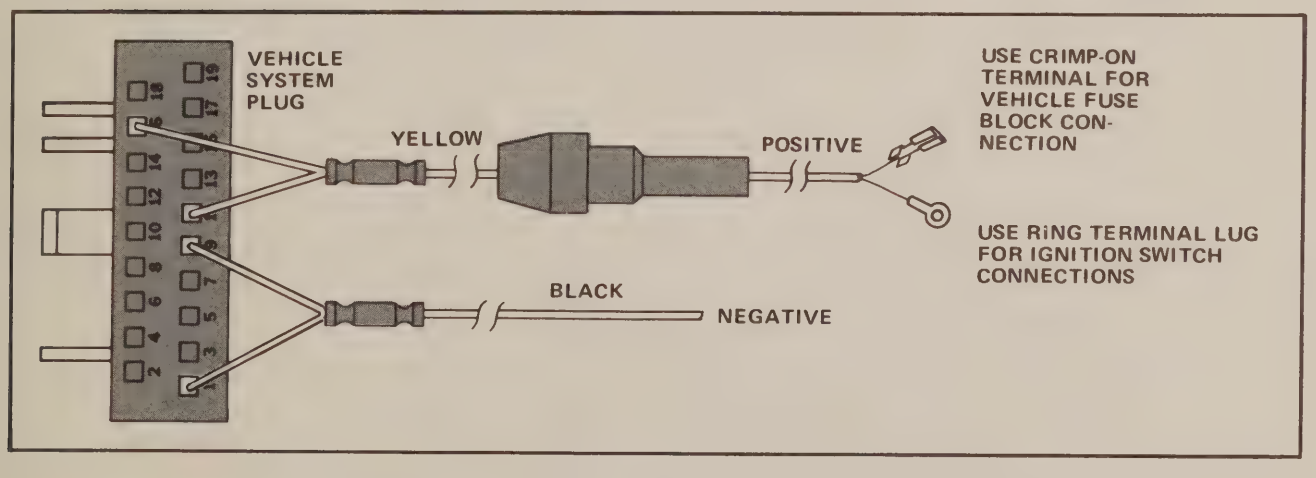


Figure 3 - 12-Volt, Negative Ground Connections

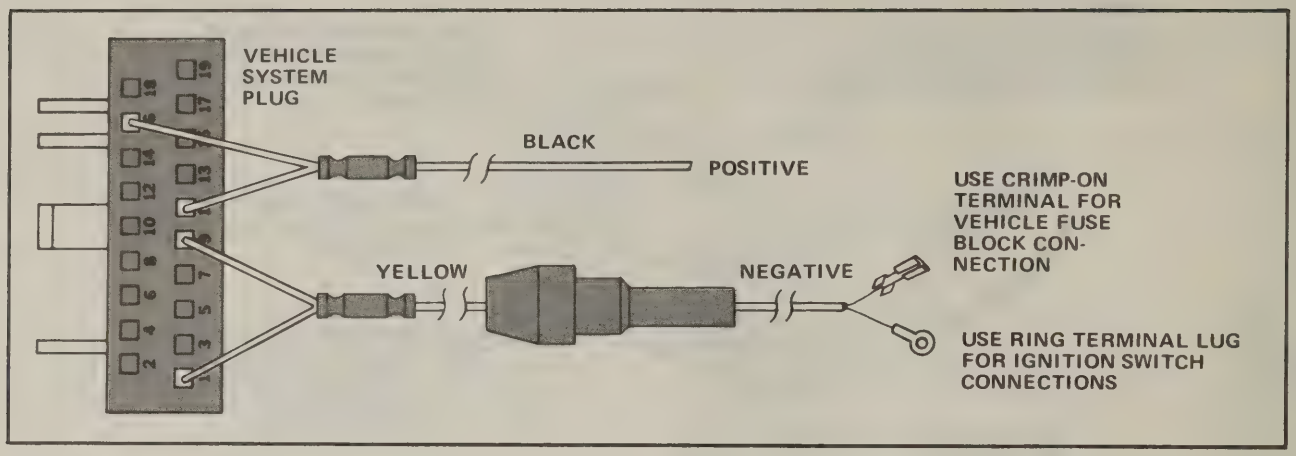


Figure 4 - 12-Volt, Positive Ground Connections (MASTR II only)

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TRANSMITTER KEYING & POWER DISTRIBUTION DIAGRAM

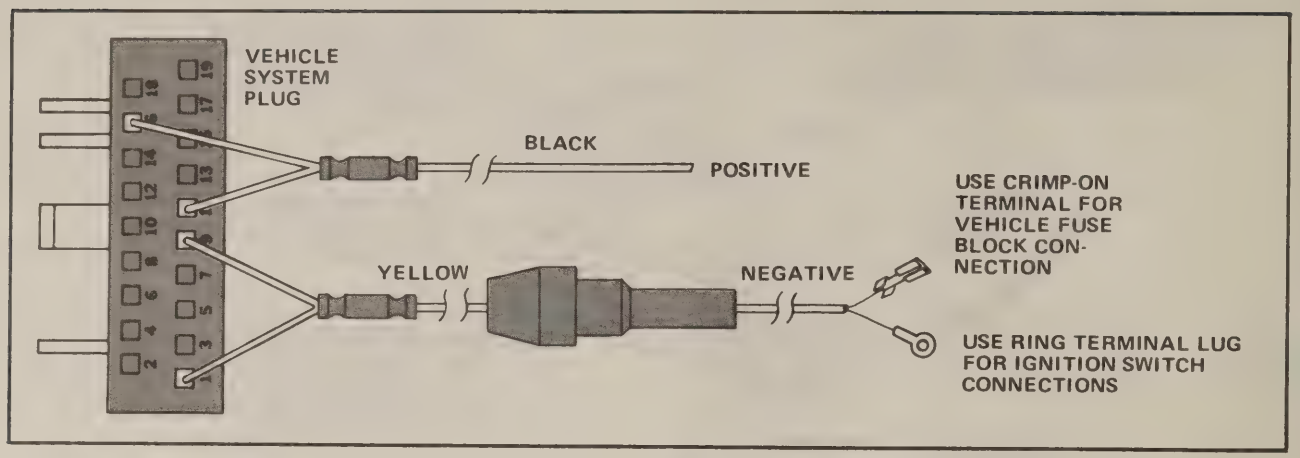

Figure 4 - 12-Volt, Positive Ground Connections (MASTR II only)

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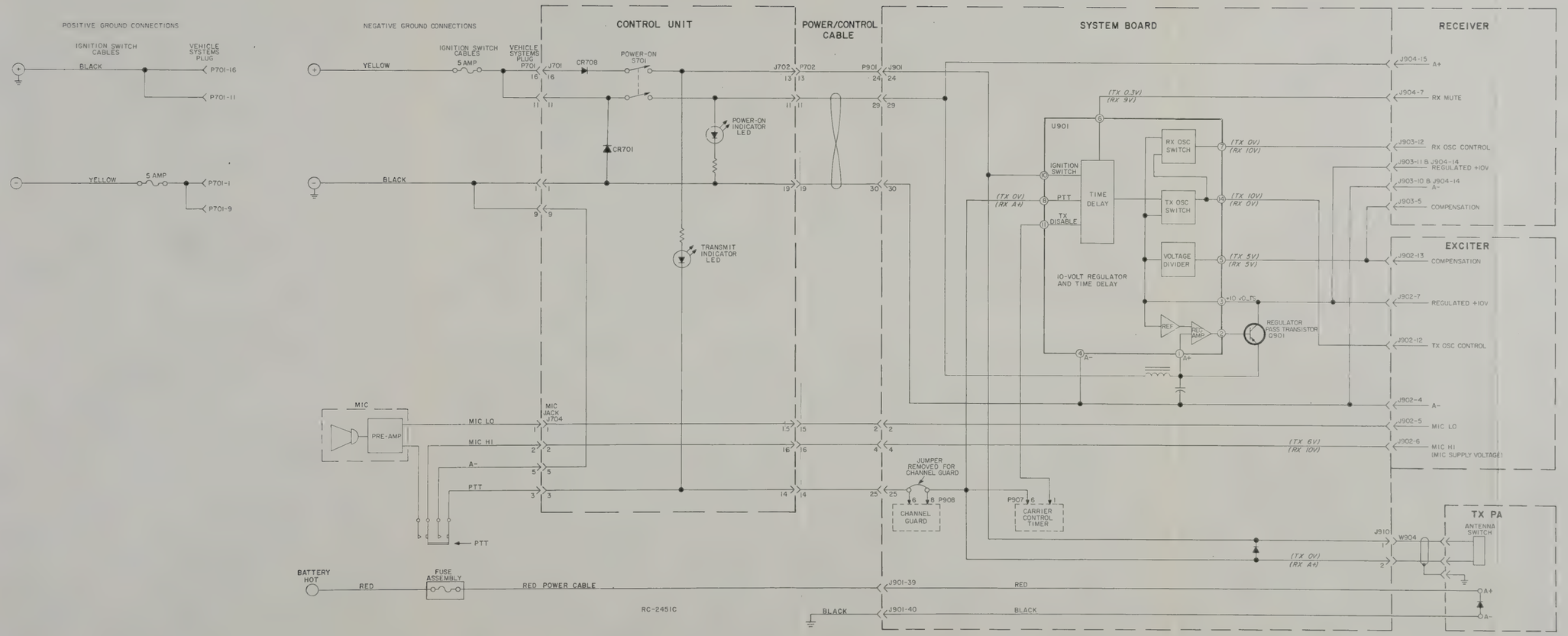
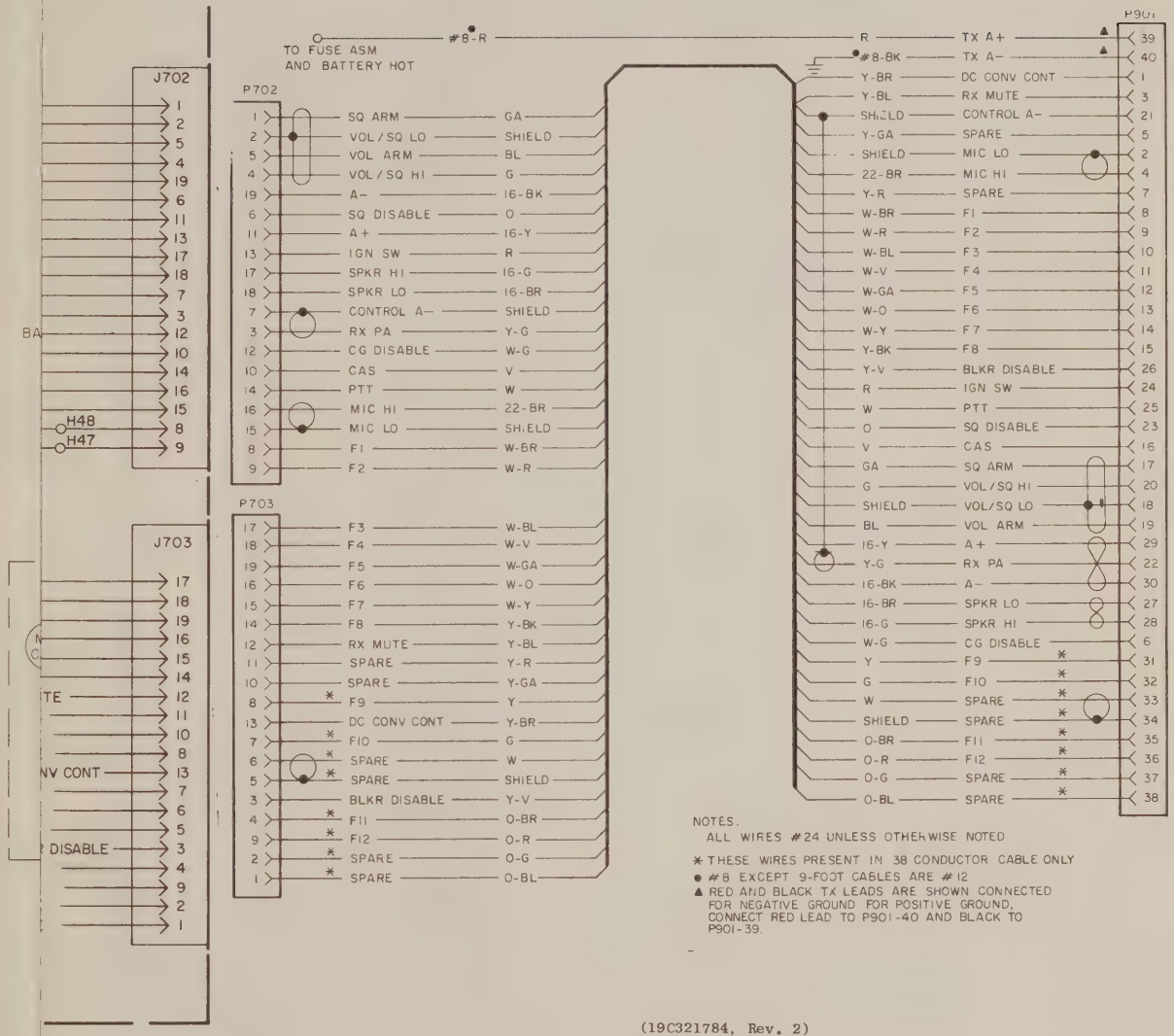


TRANSMITTER KEYING & POWER DISTRIBUTION DIAGRAM



NOTES.
ALL WIRES #24 UNLESS OTHERWISE NOTED

* THESE WIRES PRESENT IN 38 CONDUCTOR CABLE ONLY

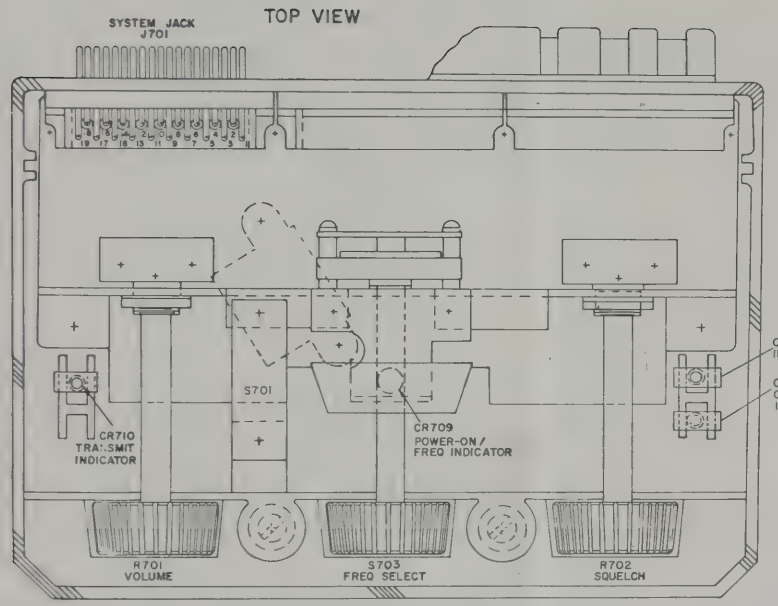
● #8 EXCEPT 9-FOOT CABLES ARE #12

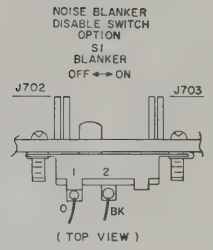
▲ RED AND BLACK TX LEADS ARE SHOWN CONNECTED FOR NEGATIVE GROUND. FOR POSITIVE GROUND, CONNECT RED LEAD TO P901-40 AND BLACK TO P901-39.

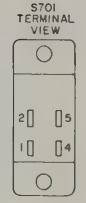
(19C321784, Rev. 2)

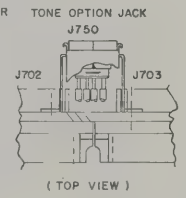
SCHEMATIC DIAGRAM

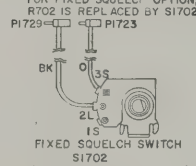
1 & 1 THRU 8 FREQUENCY CONTROL UNIT 19D423590G3 & G4

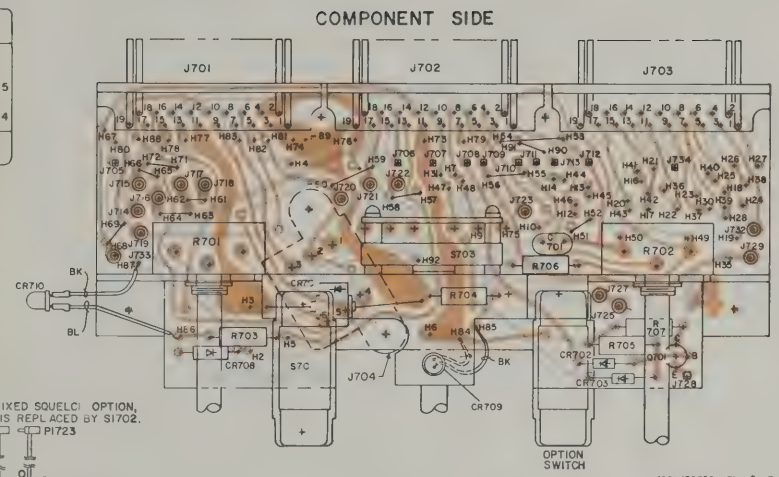


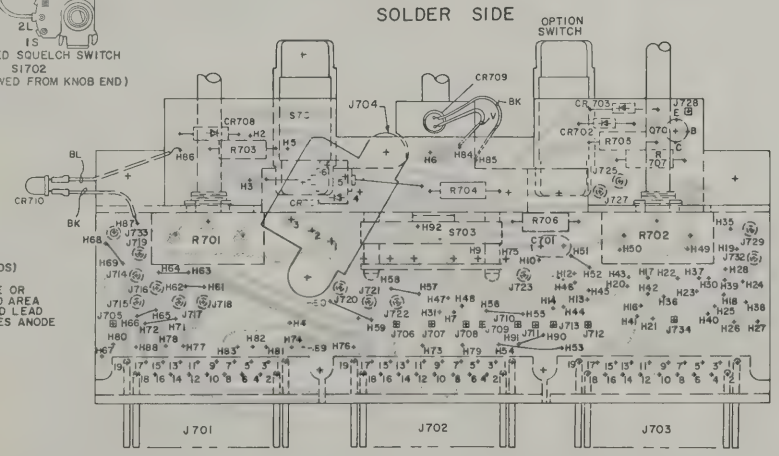








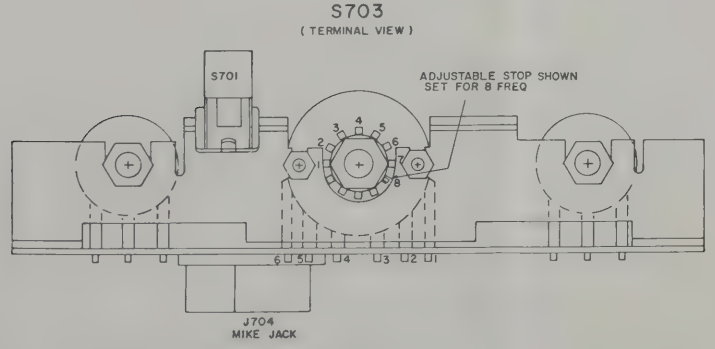


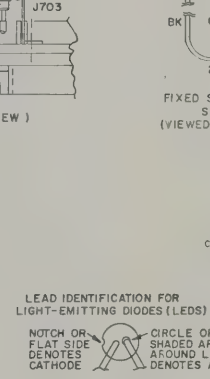


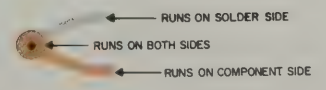
FREQUENCY SELECTOR SWITCH STOP SETTING

IF THE NUMBER OF OPERATING FREQUENCIES ARE CHANGED, IT WILL BE NECESSARY TO CHANGE THE STOP SETTING ON THE FREQUENCY SELECTOR SWITCH. TO SET THE STOP

1. REMOVE THE TWO SCREWS ON THE BOTTOM OF THE FRONT EDGE OF THE CONTROL UNIT, AND LIFT THE TOP COVER OFF.
2. REMOVE THE TWO MOUNTING SCREWS ON THE POWER-ON/ FREQUENCY INDICATOR (CR709) RETAINER AND MOVE THE INDICATOR AND RETAINER TO ONE SIDE.
3. LOOSEN AND SLIDE BACK ON THE FREQUENCY SELECTOR SWITCH SHAFT THE 3/8 INCH NUT AND WASHER HOLDING THE STOP IN PLACE.
4. ROTATE THE FREQUENCY SELECTOR SWITCH FULLY COUNTERCLOCKWISE TO THE FIXED STOP (CHANNEL 1 ON THE FREQUENCY SELECTOR SWITCH INDICATOR).
5. PLACE THE ADJUSTMENT STOP IN THE STOP POSITION CORRESPONDING TO THE DESIRED NUMBER OF OPERATING FREQUENCIES.
6. REPLACE THE 3/8-INCH NUT AND WASHER, THE POWER-ON/ FREQUENCY INDICATOR RETAINER AND MOUNTING SCREWS, AND THE CONTROL UNIT TOP COVER AND RETAINING SCREWS.
7. CHECK THE FREQUENCY SELECTOR SWITCH FOR PROPER OPERATION.







OUTLINE DIAGRAM

1 & 1 THRU 8 FREQUENCY
CONTROL UNIT 19D423590G3 & G4

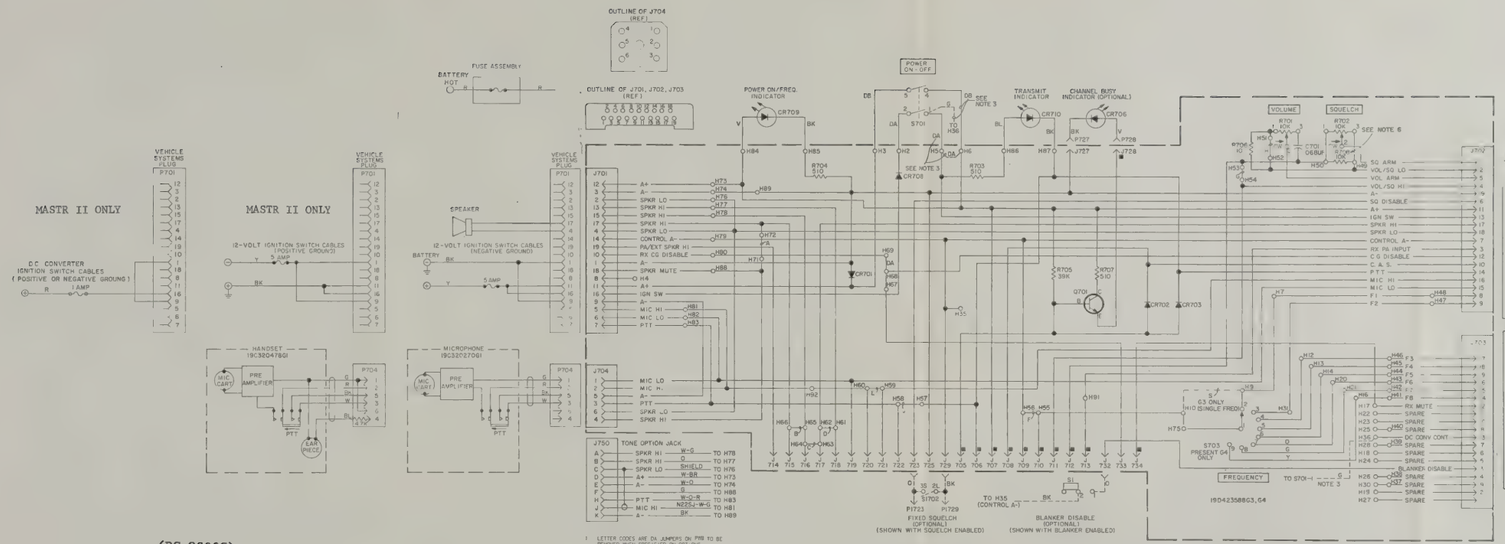
PARTS LIST

LBI30256F

C-500 SERIES CONTROL UNIT
19D423590G3 (1-FREQ)
19D423590G4 (8-FREQ)
UNIT
ASSOCIATED ASSEMBLIES

SYMBOL	GE PART NO.	DESCRIPTION
		COMPONENT BOARD 19D423598G3 (1-FREQ) 19D423598G4 (8-FREQ)
		- - - - - - - - CAPACITORS - - - - - - - - -
C101	19A700234P19	Polyester: 0.068 uF ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR701	19A116783P1	Rectifier, silicon: 100 VDC blocking, 6 amp; sim to MR751.
CR702 thru CR705	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR706	4037822P1	Silicon, 1000 mA, 400 PIV.
CR710	19B218600G3	Diode, red light emitting.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J701 thru J704	19C330257P2	Pin wafer assembly: 18 contacts.
J7704	19B219627G1	Connector: 6 contacts.
J7705 thru J7715	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
J7716 thru J7720	4033513P4	Contact, electrical: sim to Bead Chain L83-3.
J725	4033513P4	Contact, electrical: sim to Bead Chain L83-3.
J727	4033513P4	Contact, electrical; sim to Bead Chain L83-3.
J728	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
J729	4033513P4	Contact, electrical: sim to Bead Chain L83-3.
J730 thru J732	4033513P4	Contact, electrical; sim to Bead Chain L83-3.
J754	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
		- - - - - - - - TRANSISTORS - - - - - - - - -
Q701	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - RESISTORS - - - - - - - - -
R701	19A116687P2	Variable, carbon film: 10K ohms ±20%, 1/4 w; sim to Mallory M304.
R702	19A116687P1	Variable, carbon film: 10K ohms ±20%, 1/2 w, sim to Mallory M103.
R703 thru R704	3B77P511J	Composition: 510 ohms ±5%, 1/2 w.
R705	19A700113P101	Composition: 39K ohms ±5%, 1/2 w.
R706	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R707	3B77P511J	Composition: 510 ohms ±5%, 1/2 w.
		- - - - - - - - SWITCHES - - - - - - - -
S701	19A116622P5	Push: DPST, contacts rated 0.5 amp DC or 3 amps at 125 VAC; sim to Switchcraft 11E1065.
S703	19B219099G2	Rotary: 1 section, 1 pole, 8 positions (adj stop), rated 2 amps @ 28 VDC or 1 amp @ 110 VRMS; sim to Oak Mfg. Type "F".

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



1. LETTER CODES ARE DA JUMPERS ON PWB TO BE INSTALLED OR REMOVED ON OPTIONS.
2. SLEEVE WIRES OR SIZE.
3. FOR DC CONVERTER OPERATION, CHANGE WIRING AS FOLLOWS:

UNIT	CONNECT
STOI-1 TO H5	STOI-1 TO H36
STOI-8 TO H6	H5 TO H6

4. DA = .02 AWG WIRE SIZE
   DB = .18 AWG WIRE SIZE
5. ON PHOTO SOLDER JUMPERS
6. ON PHOTO SHOWS SQUELCH WHEN FIXED SQUELCH IS USED WITH P50M, ADD R708 FOR 1/2 WATT RESISTOR BETWEEN H49 & H50
7. ALL UNMARKED WIRES ARE SF-24

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

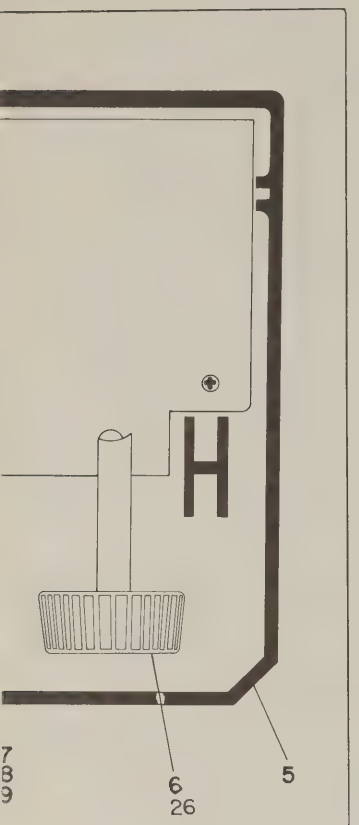
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19D423598G3	A
19D423598G5	A
19D423598G4	A
19D423598G6	A

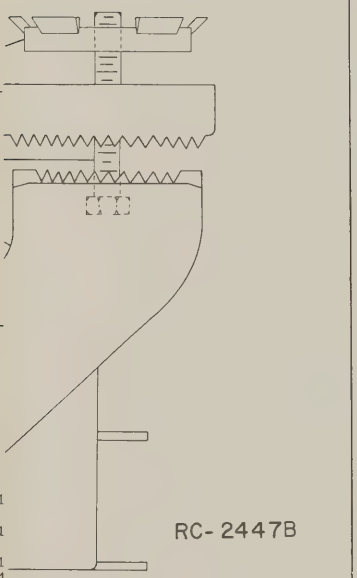
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG = 1,000,000 OHMS. ALL CAPACITOR VALUES LESS THAN 1 ARE IN MICROFARADS(MFD) UNLESS FOLLOWED BY UF= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

SCHEMATIC DIAGRAM

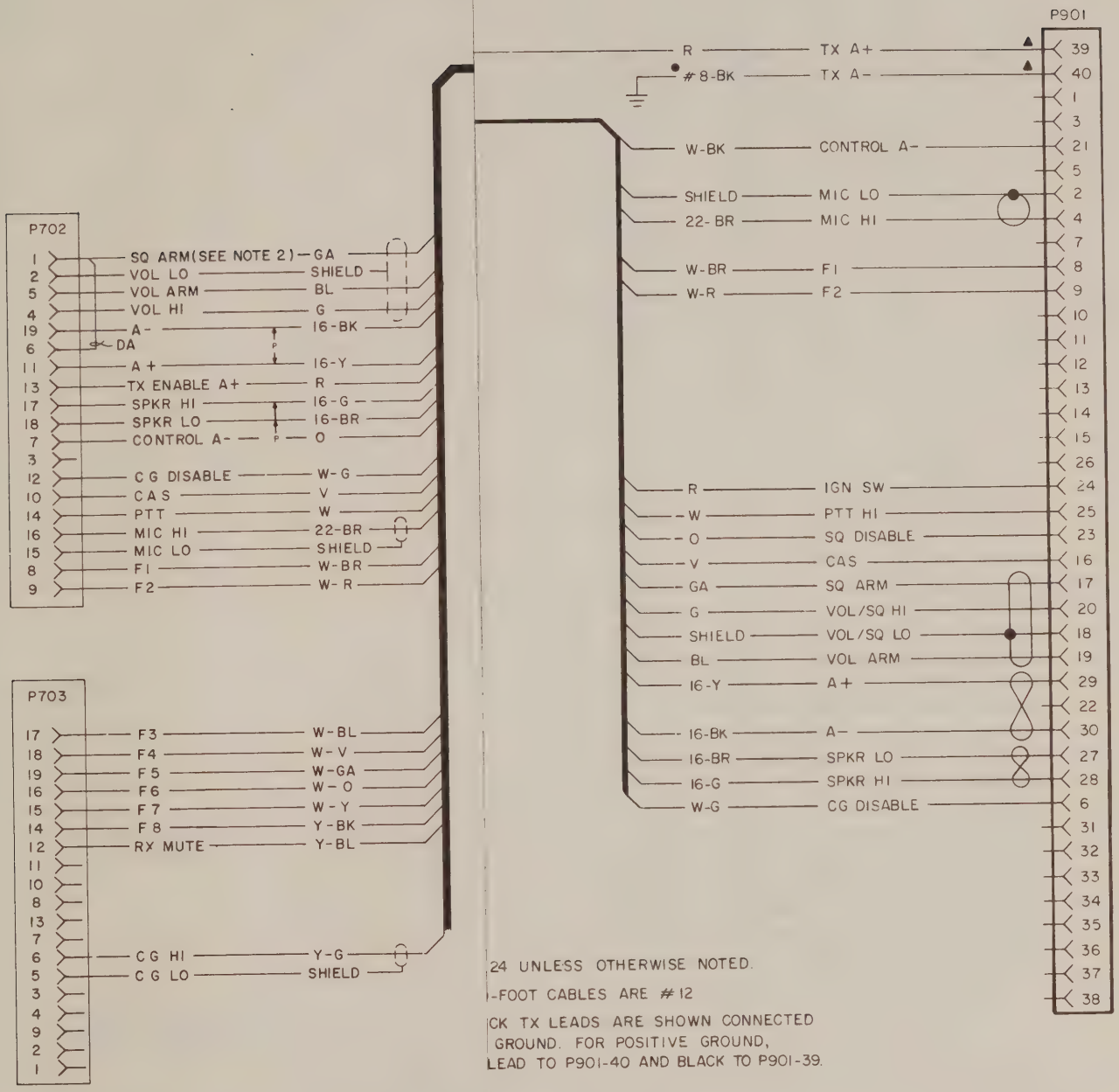
1 & 1 THRU 8 FREQUENCY
CONTROL UNIT 19D423590G3 & G4





fied by a "Revision
the unit includes all
ese revisions.

POWER/CROL CABLE 19D423424G2



24 UNLESS OTHERWISE NOTED.

-FOOT CABLES ARE #12

CK TX LEADS ARE SHOWN CONNECTED
GROUND. FOR POSITIVE GROUND,
LEAD TO P901-40 AND BLACK TO P901-39.

321783, Rev. 2)

SCHEMATIC DIAGRAMS

OPTIONAL 18-CONDUCTOR
POWER/CONTROL CABLE 19D423424G2
POWER/CONTROL CABLE 19C321890G1
MASTR II/Executive II INTERFACE

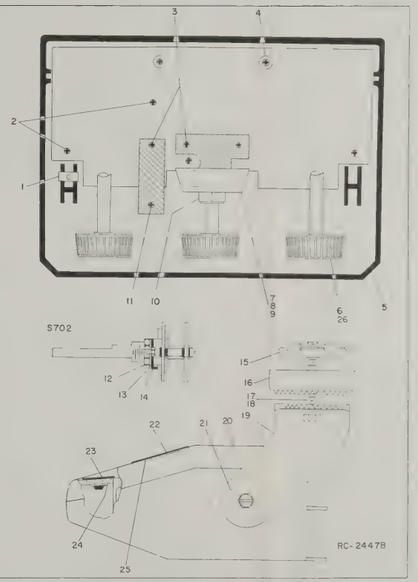
SYMBOL	GE PART NO.	DESCRIPTION
		FREQUENCY INDICATOR LIGHT ASSEMBLY 19D219698G3
		- - - - DIODES AND RECTIFIERS - - - -
	19A134354P4	Diode, optoelectronic: Green, sim to Hew. Packard 5082-4992.
		CHANNEL BUSY OPTION 19A129567G6
		- - - DIODES AND RECTIFIERS - - -
	19D219490G19	Diode, light emitting: yellow.
	19A134880P21	Clip, spring tension. (Secures CR706).
		NOISE BLANKER DISABLE OPTION 19A129567G2
		- - - - - - - - SWITCHES - - - - - - - -
		Slide: SPST, 1 pole, 2 positions, rated 0.5 amps VDC or 3 amps VAC @ 125, sim to Switchcraft 46202LR.
	4022480P1	Nut, sheet spring. sim to Vector Electronic Co. No. 440. (Secures S1).
	880P9006C6	Machine screw: No. 6-40 x 3/8.
		FIXED SQUELCH OPTION 19A129567G3
		- - - - - - - - - - SWITCHES - - - - - - - - - -
		SWITCH ASSEMBLY 19A129628G1
		- -
	4033348P1	Contact, electrical: sim to Bead Chain M12534.
	4033348P1	Contact, electrical: sim to Bead Chain M12534.
		- - - - - - RESISTORS - - - - - -
	19A700113P87	Resistor, composition: 10K ohms ±5%, 1/2 w.
		- - - - - - - - SWITCHES - - - - - - - -
	19A129628G1	Rotary: 1 section, 1 pole, 2 positions, non-shorting contacts, 2 amps @ 28 VDC or 1 amp @ 110 VRMS, sim to Oak Type "22" Series. (Includes P1723 & P1729).
		UNIVERSAL TONE JACK OPTION 19A129567G17
		- - - - - - - - - - PLUGS - - - - - - - - - -
J1	19B227105G1	Connector, receptacle: 9 contacts, sim to Winchester WSO-LRP.
	880P9006C6	Machine screw, phillips head: No. 6-40 x 5/16.
	7141225P2	Hex nut: No. 6-40.
	9406P110C6	Lockwasher, internal: No. 6.
		MECHANICAL PARTS (SEE HC2447)
	19A116807P1	Clip, spring tension.
	19A116773P106	Tap screw, POZIDRIV: 7-19 x 3/8.
	19B201074P304	Tap screw, phillips POZIDRIV®: No. 6-40 x 1/4.
	9403797C6	Flatwasher, narrow: No. 6.
	19C320389G1	Escuing.
	19B219833G1	Knob.

SYMBOL	GE PART NO.	DESCRIPTION
P	19C320175P1	Frequency Indicator.
P	NP270754A	Nameplate. (1-12).
P	NP270754B	Nameplate. (OFF, A-H).
R	19A701300P1	Retainer strap: sim to Tinsernan CS386-020-1.
R1	M117P9006C13	Tap screw: No. 6-40 x 1/4.
R2	7166075P2	Hex nut, brass: thd. size No. 3/8-32.
R3	7153130P9	Lockwasher: sim to Shakeproof 1230-2.
R4	19A134017P1	Adjustable stop.
R5	19B219578G1	Safety Release Disc.
R6	19C330022P1	Retaining bracket.
R7	M187P18010C6	Screw, hexhead, slotted: No. 10-32 x 5/8. (Quantity 1, used with safety release disc and retaining bracket).
R8	N130P1612C6	Screw, hexhead, slotted: No. 10-16 x 3/4. (Quantity 3, used without safety release disc and retaining bracket).
R9	N130P1624C6	Screw, thread forming: No. 10-16 x 1-1/2. (Quantity 3 - used without safety release disc and retaining bracket for extra thick carpet).
R10	19D416503P1	Mounting bracket.
R20	19C331834G1	Cover.
R21	M187P16010C6	Screw, hexhead, slotted: No. 10-32 x 5/8.
R22	NP270753P1	Nameplate. (MASTR II SOLID STATE).
R23	19B219626P1	Knob plug. (Frequency switch S702).
R24	7140578P6	Nut, push on: sim to Tinsernan C318-012-67. (Used with item 23).
R25	19A130009P1	Diffuser.
R26	7160815P4	(Not Used).
		ASSOCIATED ASSEMBLIES
		POWER/CONTROL CABLE 30 CONDUCTOR 19D629249G8
		- - - - - - - - - - PLUGS - - - - - - - - - -
J702		Connector. Includes:
	19B236516G1	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Quantity 4).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 15).
P703		Connector. Includes:
	19B226516G2	Shell.
	19A116781P2	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 11).
P901		Connector, special purpose. Includes:
	19C307163P1	Shell.
	19A701376P1	Contact, electrical rated @ 4 amps; sim to AMP 350657-1. (Quantity 28).
	19A701376P2	Contact, electrical rated @ 4 amps; sim to AMP 350658-1. (Quantity 4).
	19A701376P3	Contact, electrical rated @ 35 amps; sim to AMP 350655-1. (Quantity 2).
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	7139885P14	Cable: 27 conductor, 20 feet.
	7142878G1	Clip loop. (Strain relief).
	19B209245P103	Spacer.
	19A134241P1	Jackscrew. (Used with P901).
	19C328123P1	Adapter. (Located between P901 & mounting surface).

SYMBOL	GE PART NO.	DESCRIPTION
		POWER/CONTROL CABLE NEGATIVE GRD EXECUTIVE II INTERFACE 19C328180G1
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		Connector. Includes:
	19C331409P1	Shell.
	19D413038P1	Connector Cover. (Rut side).
	19D413039P2	Connector Cover. (Screw side).
P702		Connector. Includes:
	19B226516G1	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG, sim to Molex 08-50-0108.
P703		Connector. Includes:
	19B226516G2	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		OPTIONAL 12-VOLT 3-WIRE IGNITION SWITCH CABLE 19B219537G1
		- - - - - - - - - - PLUGS - - - - - - - - - -
P701		Connector. Includes:
	19B226516G3	Shell.
	19A129504G1	Y Cable. (BLACK).
		FUSED LEAD ASSEMBLY 19A129480G1 1 AMP (RED) (Used with 19B219537G1)
	1R16P3	Quick blowing: 1 amp at 250 v; sim to Littelfuse 312001 or Bussmann AGC-1.
	19A115776P6	Fuseholder: sim to Bussmann 9835.
	19A115776P5	Knob assembly: sim to Bussmann 9903 1/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact: sim to Littelfuse 904-88. (Located inside fuseholder).
	749182329	Solderless terminal: wire size No. 16-14 AWG.
	402948429	Terminal, quick connect: wire size 14-18 AWG, fits 1/4 x .032 tab; sim to AMP 41274.
	19A116849P1	Insulated splice.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		FUSED LEAD ASSEMBLY 19A129480G2 5 AMP (YELLOW) (Used with 19B219537G1)
	1R16P8	Cartridge, quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
	19A115776P6	Spring: sim to Bussmann 9835.
	19A115776P5	Knob assembly: sim to Bussmann 9903 1/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact: sim to Littelfuse 904-88. (Located inside fuseholder).
	749182329	Solderless terminal: wire size No. 16-14 AWG.
	402948429	Terminal, quick connect: wire size 14-18 AWG, fits 1/4 x .032 tab; sim to AMP 41274.
	19A116849P1	Insulated splice.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		DC CONVERTER IGNITION SWITCH CABLE 19B219537G2
		- - - - - - - - PLUGS - - - - - - - -
P701		Connector. Includes:
	19B226516G3	Shell.
	19A130117G1	Jumper.

SYMBOL	GE PART NO.	DESCRIPTION
		FUSED LEAD ASSEMBLY 19A129480G1 (Used with 19B219537G3)
	1R16P3	Quick blowing: 1 amp at 250 v; sim to Littelfuse 312001 or Bussmann AGC-1.
	19A115776P6	Fuseholder: sim to Bussmann 9835.
	19A115776P5	Knob assembly: sim to Bussmann 9903 1/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact: sim to Littelfuse 904-88. (Located inside fuseholder).
	749182329	Solderless terminal: wire size No. 16-14 AWG.
	402948429	Terminal, quick connect: wire size 14-18 AWG, fits 1/4 x .032 tab; sim to AMP 41274.
	19A116849P1	Insulated splice.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		FUSED LEAD ASSEMBLY 19A129480G2 5 AMP (YELLOW) (Used with 19B219537G1)
	1R16P8	Cartridge, quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
	19A115776P6	Spring: sim to Bussmann 9835.
	19A115776P5	Knob assembly: sim to Bussmann 9903 1/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact: sim to Littelfuse 904-88. (Located inside fuseholder).
	749182329	Solderless terminal: wire size No. 16-14 AWG.
	402948429	Terminal, quick connect: wire size 14-18 AWG, fits 1/4 x .032 tab; sim to AMP 41274.
	19A116849P1	Insulated splice.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.

SYMBOL	GE PART NO.	DESCRIPTION
		25 - 50 MHz ANTENNA
	749107491	Antenna: includes stainless steel rod approx 96-1/2 inches long, ball tip; hockscrew; No. 10-32 hex socket set screw, sim to Antenna Specialists ASFA38GX. (30-50 MHz).
	749107492	Antenna: includes stainless steel rod approx 102 inches long; ball tip; No. 10-32 hex socket set screw; sim to Antenna Specialists ASFA38GX. (25-30 MHz).
	7102B30P3	Adapter, antenna: approx 3-5/16 inches long. (Used with GE Dwg 749107491).
	4K7B41	Loading coil: 25-33 MHz; sim to Antenna Specialists ASP487.
	19A121577G1	Antenna hook kit.
	7134724P1	Antenna hook.
	19C307172P1	Antenna Package: Includes base & ball assembly, adapter spring assembly, cable assembly, horseshoe plate, and rubber gasket.
*		Base and ball assembly. Newtronics 5485.
		Adapter spring assembly. Newtronics 3327.
*		Cable assembly. Newtronics 183-BAO.
		Horseshoe plate. Newtronics 3323-3.
		Rubber gasket. Newtronics 3320.
		66 - 88 MHz ANTENNA 19C320111P5
	19C320111G1	Antenna base: 15 ft. cable with M282ZP1 connector with 71D538177 adapter, sim to Decibel Products DB719.
	19C320111G2	Antenna whip and spring base: sim to Decibel Products DB670A.
		132 - 512 MHz ANTENNA 19B209568P1
		Whip assembly. 068110-001.
		Whip nut assembly. 068047-001.
		Base nut assembly. 068048-001.
		"O" Ring (LARGE). 007059-122.
		Stud assembly. 068046-001.
		RG58/U Cable, 15 ft. 068115-001.
		800 - 870 MHz ANTENNA 19B209568P4
		Whip assembly. 068110-001.
		Whip nut assembly. 068047-001.
		Base nut assembly. 068048-001.
		"O" Ring (LARGE). 007059-122.
		Stud assembly. 068046-001.
	19B209501P6	Plug, Type N: sim to UG536B/U..
		Cable. (Included as part of complete antenna assembly only).
		12 VOLT FUSE ASSEMBLY 19B216031G4 (Fuses must be ordered separately)
		- - - - - - - - FUSES - - - - - - - -
F1	1R11P4	Quick blowing: 15 amps, 250 v; sim to Bussmann MOV15. (Used with 16-06 w MASTR II Mobiles).
F3	1R11P7	Quick blowing: 30 amps, 250 v; sim to Bussmann MOV30. (Used with 66-12B w MASTR II and EXECUTIVE II Mobiles).
F4	1R11P5	Quick blowing: 20 amps, 250 v; sim to Bussmann MOV20. (Used with 38-06 w MASTR II and 35-88 w EXECUTIVE II Mobiles).



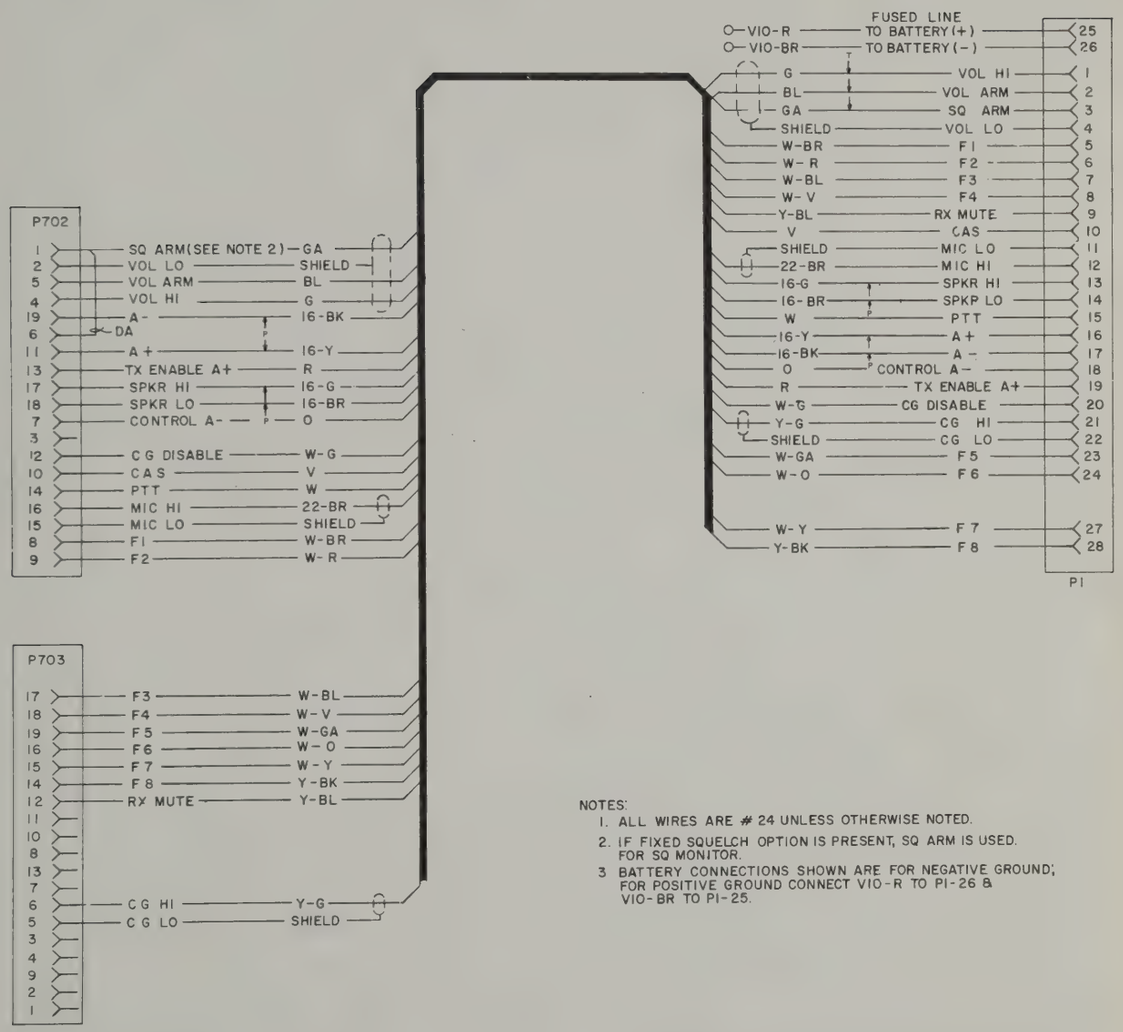
PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a Revision Letter which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - Channel Busy Option 19A129567G6
To provide a yellow channel busy indicator. Replaced CR706 which was 19D219600G2- Diode, red light emitting.

REV. A - Component Board 19D423380G1, 2
Replaced JA jumper between H90-H91 with printed wire run.

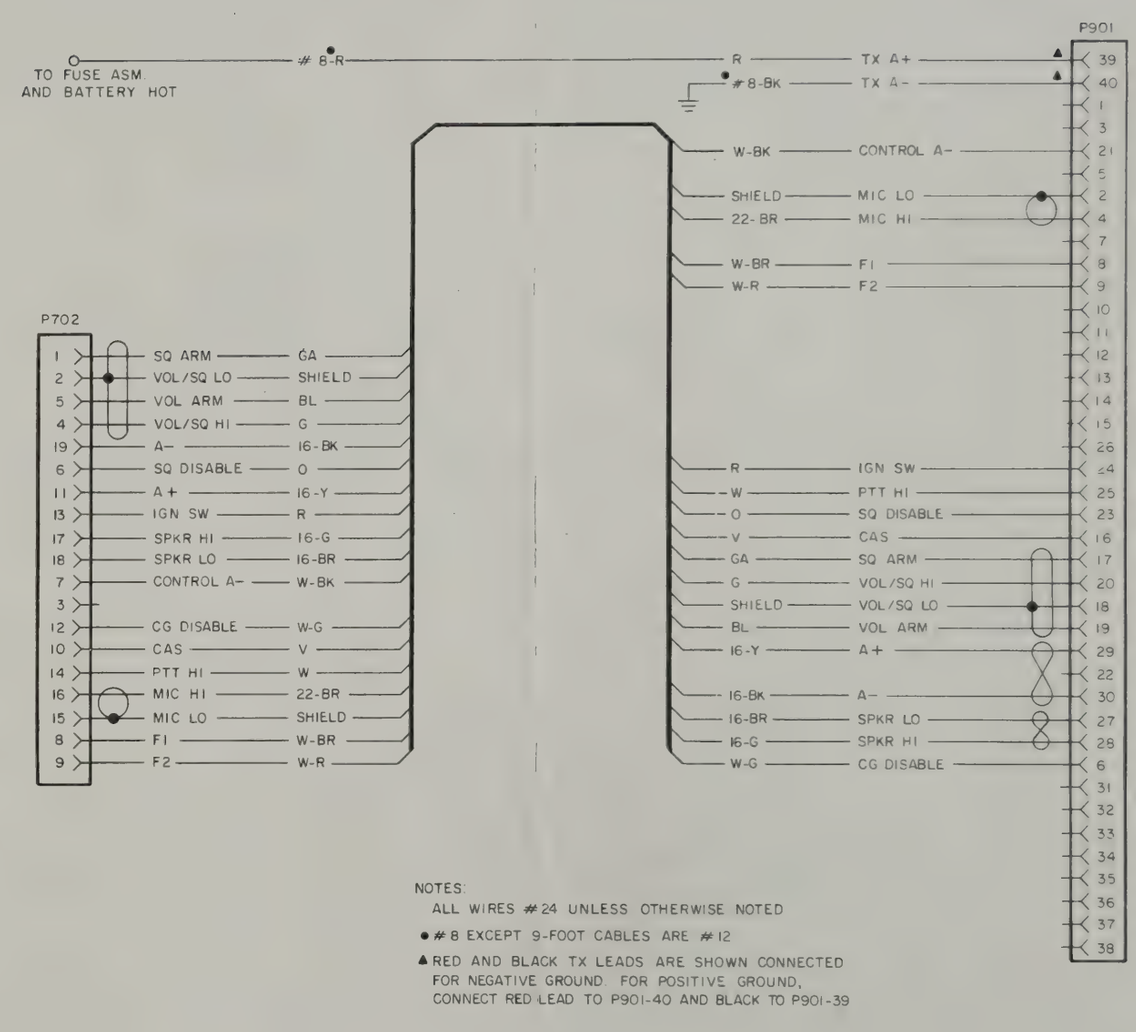
POWER/CONTROL CABLE 19C321890G1


FUSED LINE
VIO-R — TO BATTERY (+) — 25
VIO-BR — TO BATTERY (-) — 26
P702
1 SQ ARM (SEE NOTE 2) — GA
2 VOL LO — SHIELD
5 VOL ARM — BL
4 VOL HI — G
19 A- — 16-BK
6 DA
11 A+ — 16-Y
13 TX ENABLE A+ — R
17 SPKR HI — 16-G
18 SPKR LO — 16-BR
7 CONTROL A- — O
3
12 C G DISABLE — W-G
10 CAS — V
14 PTT — W
16 MIC HI — 22-BR
15 MIC LO — SHIELD
8 FI — W-BR
9 F2 — W-R
G — VOL HI — 1
BL — VOL ARM — 2
GA — SQ ARM — 3
SHIELD — VOL LO — 4
W-BR — F1 — 5
W-R — F2 — 6
W-BL — F3 — 7
W-V — F4 — 8
Y-BL — RX MUTE — 9
V — CAS — 10
SHIELD — MIC LO — 11
22-BR — MIC HI — 12
16-G — SPKR HI — 13
16-BR — SPKP LO — 14
W — PTT — 15
16-Y — A+ — 16
16-BK — A- — 17
O — CONTROL A- — 18
R — TX ENABLE A+ — 19
W-G — CG DISABLE — 20
Y-G — CG HI — 21
SHIELD — CG LO — 22
W-GA — F5 — 23
W-O — F6 — 24
W-Y — F7 — 27
Y-BK — F8 — 28
P1
P703
17 F3 — W-BL
18 F4 — W-V
19 F5 — W-GA
16 F6 — W-O
15 F7 — W-Y
14 F8 — Y-BK
12 RX MUTE — Y-BL
11
10
8
13
7
6 C G HI — Y-G
5 C G LO — SHIELD
3
4
9
2
1

NOTES:
1. ALL WIRES ARE # 24 UNLESS OTHERWISE NOTED.
2. IF FIXED SQUELCH OPTION IS PRESENT, SQ ARM IS USED FOR SQ MONITOR.
3. BATTERY CONNECTIONS SHOWN ARE FOR NEGATIVE GROUND; FOR POSITIVE GROUND CONNECT VIO-R TO P1-26 & VIO-BR TO P1-25.

(19C321630, Rev. 4)

POWER/CONTROL CABLE 19D423424G2


TO FUSE ASM. AND BATTERY HOT
8-R — R — TX A+ — P901-39
8-BK — TX A- — P901-40
W-BK — CONTROL A- — P901-21
SHIELD — MIC LO — P901-2
22-BR — MIC HI — P901-4
W-BR — FI — P901-8
W-R — F2 — P901-9
R — IGN SW — P901-24
W — PTT HI — P901-25
O — SQ DISABLE — P901-23
V — CAS — P901-16
GA — SQ ARM — P901-17
G — VOL/SQ HI — P901-20
SHIELD — VOL/SQ LO — P901-18
BL — VOL ARM — P901-19
16-Y — A+ — P901-29
16-BK — A- — P901-30
16-BR — SPKR LO — P901-27
16-G — SPKR HI — P901-28
W-G — CG DISABLE — P901-6
P702
1 SQ ARM — GA
2 VOL/SQ LO — SHIELD
5 VOL ARM — BL
4 VOL/SQ HI — G
19 A- — 16-BK
6 SQ DISABLE — O
11 A+ — 16-Y
13 IGN SW — R
17 SPKR HI — 16-G
18 SPKR LO — 16-BR
7 CONTROL A- — W-BK
3
12 CG DISABLE — W-G
10 CAS — V
14 PTT HI — W
16 MIC HI — 22-BR
15 MIC LO — SHIELD
8 FI — W-BR
9 F2 — W-R
P901
31
32
33
34
35
36
37
38

NOTES:
ALL WIRES #24 UNLESS OTHERWISE NOTED
● # 8 EXCEPT 9-FOOT CABLES ARE # 12
▲ RED AND BLACK TX LEADS ARE SHOWN CONNECTED FOR NEGATIVE GROUND. FOR POSITIVE GROUND, CONNECT RED LEAD TO P901-40 AND BLACK TO P901-39

(19C321783, Rev. 2)

SCHEMATIC DIAGRAMS

OPTIONAL 18-CONDUCTOR
POWER/CONTROL CABLE 19D423424G2
POWER/CONTROL CABLE 19C321890G1
MASTR II/Executive II INTERFACE

PARTS LIST

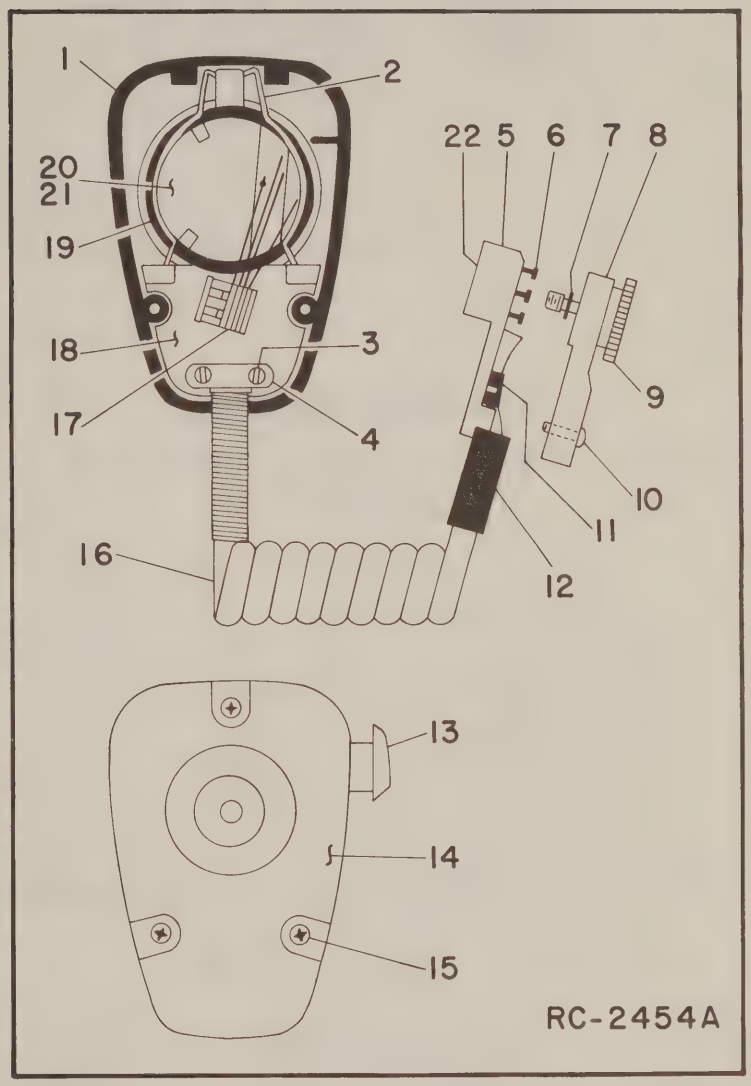
30 CONDUCTOR POWER/CONTROL CABLES
19D900447G1 3 METER SHORT GROUND
19D900447G2 3 METER LONG GROUND
19D900447G3 6 METER SHORT GROUND
19D900447G4 6 METER LONG GROUND
19D900447G5 9 METER SHORT GROUND
19D900447G6 9 METER LONG GROUND
ISSUE 2

GE PART NO.	DESCRIPTION
	Connector. Includes:
19D900037P1	Shell.
19A701376P1	Contact, electrical rated @ 4 amps; sim to AMP 350657-1. (P1-1 thru 17, 26 thru 34).
19A701376P2	Contact, electrical rated @ 4 amps; sim to AMP 350656-1. (P1-18 thru 21).
19A701376P3	Contact, electrical rated @ 35 amps; sim to AMP 350655-1. (P1-37 & 38).
19D900015P1	Housing.
19C850508P1	Cover.
19B800882P1	Thumbscrew: thd. size M4 x 0.7.
19A701488P4	Retaining ring. (Located on thumbscrew).
19A701312P6	Flat washer: 1.7-1.85 ID. (Located on thumbscrew)
19A701507P608	Screw, thd. forming: No. 3.5-1.27 x 12.7. (Secures housing to shell).
19A701507P606	Screw, thread forming: No. 3.5-1.27 x 9.60. (Secures cover to housing).
19A700031P425	Machine screw, POZIDRIV®: M3-0.5 x 25. (Secures cable to P1).
19A700034P5	Hex nut: No. M3.5 x 0.6. (Secures cable to P1).
19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures cable to P1).
	Connector. Includes:
19B226516G1	Shell.
19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (P2-11, 17 thru 19).
19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P2-1 thru 10, 12 thru 16).
	Connector. Includes:
19B226516G2	Shell.
19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P3-1 thru 3, 5, 6, 10 thru 13, 17, 18).
	- - - - - - - - - MISCELLANEOUS - - - - - - - - -
7139880P16	Cable, special purpose: 34 conductors. (Specify length).
19A701460P2	Cable battery, red; sim to GE S1-57528. (Used in G1 & G2 - Specify length).
19A701460P10	Cable battery, black. (Used in G1 & G2 - Specify length).
19A701460P2	Cable battery, red; sim to GE S1-57528. (Used in G3 - G6 - Specify length).
19A701460P10	Cable battery, black. (Used in G3 - G6 - Specify length).
19B800629P1	Solderless terminal. (Located on black battery cable in G3 & G5).
19B800629P3	Solderless terminal. (Located on black battery cable in G4 & G6, on red battery cable in G3 - G6).
7142878G1	Clip loop. (Secures cable at P2 & P3).

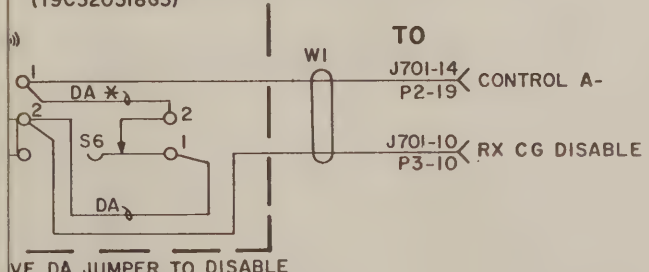
NENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	
	- - - - - - - - -
S1	tts, 8 ohms nse; sim to
S2 and S3	- - - - - - - -
S5	t long, includes
S6	S - - - - - - - -
W1	een housing &
W2	tween mounting
	7-19 x 1/2.
	7-19 x 3/4.
	(Secures mount- h safety release
	-16 x 3/4. release disc &
	-32 x 5/8. retaining
	-16 x 3/4. e).
	-16 x 1-1/2. g to extra thick

CTION CHANGES



L MIC HOOKSWITCH
(19C320318G3)



VE DA JUMPER TO DISABLE
MATIC CHANNEL GUARD MONITOR
SHOWN OFF HOOK
SHOWN OFF MONITOR

MODEL NO.	REV LETTER

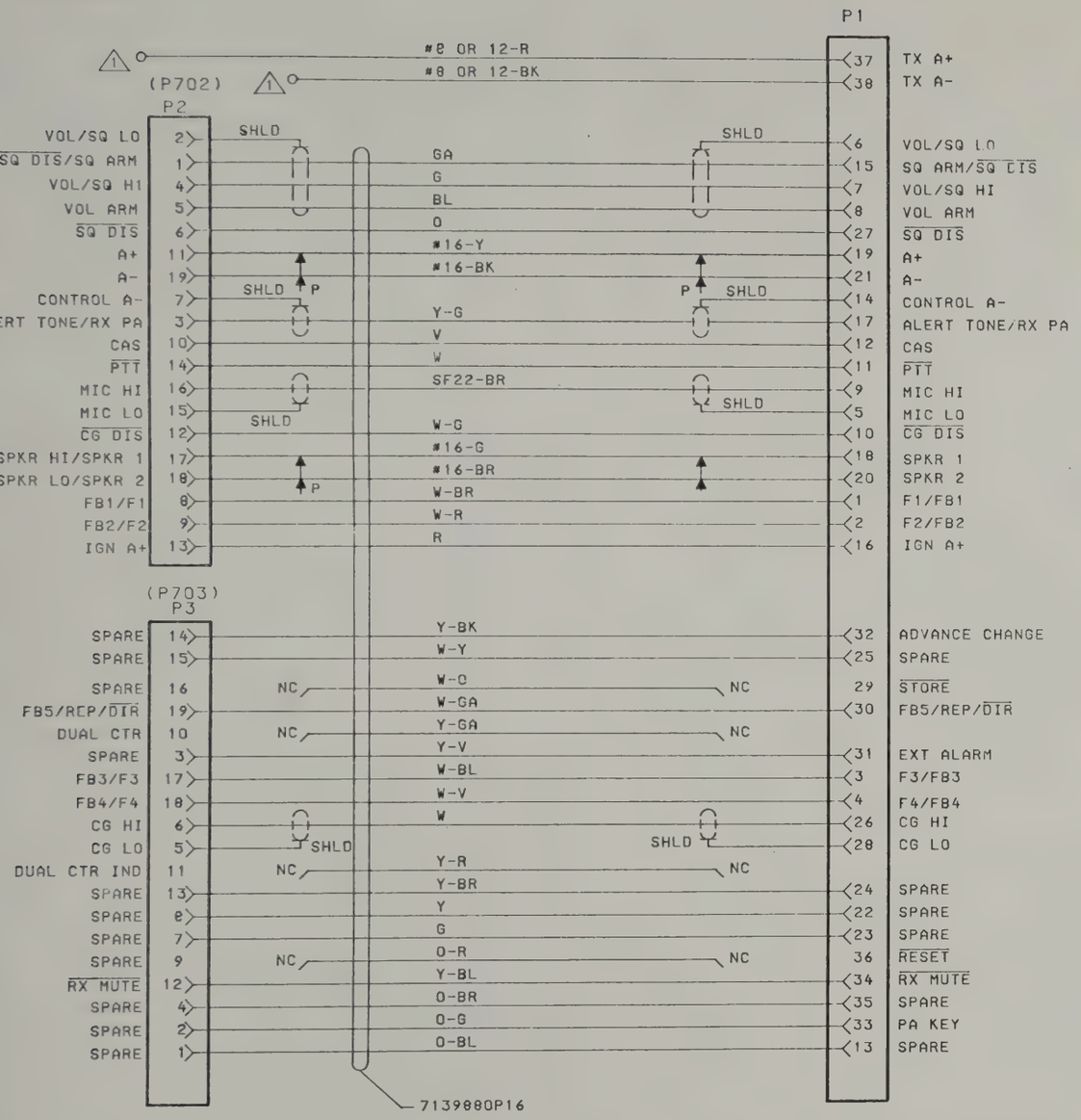
136836, Rev. 2)

*COMPO

SERVICE SHEET

MICROPHONE & HOOKSWITCH

Issue 5



⚠1 ELECTRICALLY UNCONNECTED UNTIL INSTALLED BUT TERMINATED PER ASM 19D900447.
2. ALL WIRES ARE #SF24 AWG UNLESS OTHERWISE SPECIFIED.

SCHEMATIC DIAGRAM

(19D433081, Rev. 3)

MASTR DELTA INTERFACE CABLE
19D900447G1-G6

PARTS LIST

30 CONDUCTOR POWER/CONTROL CABLES
19D900447G1 3 METER SHORT GROUND
19D900447G2 3 METER LONG GROUND
19D900447G3 6 METER SHORT GROUND
19D900447G4 6 METER LONG GROUND
19D900447G5 9 METER SHORT GROUND
19D900447G6 9 METER LONG GROUND
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
P1		Connector. Includes:
	19D900037P1	Shell.
	19A701376P1	Contact, electrical rated @ 4 amps; sim to AMP 350657-1. (P1-1 thru 17, 26 thru 34).
	19A701376P2	Contact, electrical rated @ 4 amps; sim to AMP 350656-1. (P1-18 thru 21).
	19A701376P3	Contact, electrical rated @ 35 amps; sim to AMP 350655-1. (P1-37 & 38).
	19D900015P1	Housing.
	19C850508P1	Cover.
	19B800882P1	Thumbscrew: thd. size M4 x 0.7.
	19A701488P4	Retaining ring. (Located on thumbscrew).
	19A701312P6	Flat washer: 1.7-1.85 ID. (Located on thumbscrew)
	19A701507P608	Screw, thd. forming: No. 3.5-1.27 x 12.7. (Secures housing to shell).
	19A701507P606	Screw, thread forming: No. 3.5-1.27 x 9.60. (Secures cover to housing).
	19A700031P425	Machine screw, POZIDRIV®: M3-0.5 x 25. (Secures cable to P1).
	19A700034P5	Hex nut: No. M3.5 x 0.6. (Secures cable to P1).
	19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures cable to P1).
P2		Connector. Includes:
	19B226516G1	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (P2-11, 17 thru 19).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P2-1 thru 10, 12 thru 16).
P3		Connector. Includes:
	19B226516G2	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P3-1 thru 3, 5, 6, 10 thru 13, 17, 18).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	7139880P16	Cable, special purpose: 34 conductors. (Specify length).
	19A701460P2	Cable battery, red; sim to GE S1-57528. (Used in G1 & G2 - Specify length).
	19A701460P10	Cable battery, black. (Used in G1 & G2 - Specify length).
	19A701460P2	Cable battery, red; sim to GE S1-57528. (Used in G3 - G6 - Specify length).
	19A701460P10	Cable battery, black. (Used in G3 - G6 - Specify length).
	19B800629P1	Solderless terminal. (Located on black battery cable in G3 & G5).
	19B800629P3	Solderless terminal. (Located on black battery cable in G4 & G6, on red battery cable in G3 - G6).
	7142878G1	Clip loop. (Secures cable at P2 & P3).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

LBI30449E

MICROPHONE HOOKSWITCH
19C320318G3, G5

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P18	Slide: 1 pole, 2 positions, 0.5 amp VAC or 3 amp VAC at 125 v; sim to Switchcraft 46202LH. (Used in G3).
S2 and S3	19A116676P1	Sensitive: SPDT, 5 amps @ 24 VDC or 5 amps @ 250 VRMS; sim to Microswitch 111S M1-T2. (Used in G5).
S5	19A116676P1	Sensitive: SPDT, 5 amps @ 24 VDC or 5 amps @ 250 VRMS; sim to Microswitch 111S M1-T2. (Used in G5).
S6	19A134398P1	Push: sim to Chicago Switch S-1527-1. (Used in G3).
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts. (Used in G3).
W2	19B219779G1	Cable: approx 4 ft. long. Includes: (5) 4036634P1 & (2) 19B209288P2 contacts. (Used in G5).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B219698G4	Housing. (Used in G3).
	19B219698G2	Housing. (Used in G5).
	19B219694P1	Base plate.
	19A702464P2	Bushing, strain relief: sim to Heyco SR-3P-4. (Used in G3).
	N193P1410C	Tap screw: No. 8-18 x 5/8. (Secures base plate to mounting surface).
	19A134398P101	Metal plate. (Used with S6).
	19C320301P1	Support. (S1).
	19B219693P2	Spring, hooksswitch. (Used with S1).
	19B800608P527	Rivet. (Secures S1 spring).
	19B800608P477	Rivet. (Secures S1).
	7147223P2	Clip loop. (Used in G5).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

LBI4488D

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - LOUDSPEAKERS - - - - - - -
LS1	19A116694P1	Permanent magnet: 5 inch, 8 ohms ±10% imp, 20 w. max operating; sim to Oaktron 5EU2189-2. (Used in G1, G6, & G8).
LS2	19A116910P1	Permanent magnet: 5 inch, 3.2 ohms ±15% imp, 5 w. max operating; sim to Pioneer 002009. (Used in G2-G5, G7, G9-G12).
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts. (Used in G1, G9-G12).
W2	19A122167G1	Cable assembly: approx 4 feet long. (Used in G2, G5, & G8). Includes:
P702	5493018P2	Plug: 5 contacts, sim to Cinch 204-31-05-010.
	5491563P4	Cover; sim to Methode C8C0-V.
W3	19A121546G1	Cable: approx 4 feet long. (Includes (2) 19A121429P1 pins - Used in G3 & G4).
W4	19A130648G1	Cable assembly: approx 5 feet long. (Used in G6). Includes:
P1		Connector. Includes:
	19B209288P16	Shell.
	5496809P18	Contact, electrical. (Quantity 2).
W5	19A136574G1	Cable assembly: approx 4 feet long. Includes (2) 19A115884P8 contacts.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B219692G1	Grille. (Used in G1, G4-G7, & G10).
	19B219692G2	Grille. (Used in G2, G8, & G9).
	19B219692G3	Grille. (Used in G3).
	19B219692G4	Grille. (Used in G11).
	19B219692G5	Grille. (Used in G12).
	19B227593G1	Housing. (Used in G1, G4-G7, & G10).
	19B227593G2	Housing. (Used in G2, G8, & G9).
	19B227593G3	Housing. (Used in G3).
	19B227593G4	Housing. (Used in G11).
	19B227593G5	Housing. (Used in G12).
	19C320016P1	Mounting bracket. (Located between housing & retaining bracket).
	19C320022P1	Retaining bracket. (Located between mounting bracket & safety release disc).
	19B219578G1	Safety Release Disc.
	19A116986P108	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 1/2. (Secures speaker to housing).
	19A116986P112	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 3/4. (Secures grille to housing).
	N187P16010C6	Machine screw: No. 10-32 x 5/8. (Secures mounting bracket to housing - Used with safety release disc, retaining bracket).
	N710P16012C6	Screw, hexhead, slotted: No. 10-16 x 3/4. (Quantity 3 - Used without safety release disc & retaining bracket).
	N187P16010C6	Machine screw, slotted: No. 10-32 x 5/8. (Used with safety release disc & retaining bracket).
	N130P16012C6	Tap screw, thd. forming: No. 10-16 x 3/4. (When mounting to regular surface).
	N130P16024C6	Tap screw, thd. forming: No. 10-16 x 1-1/2. Slotted hex head. (When mounting to extra thick mounting surface).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

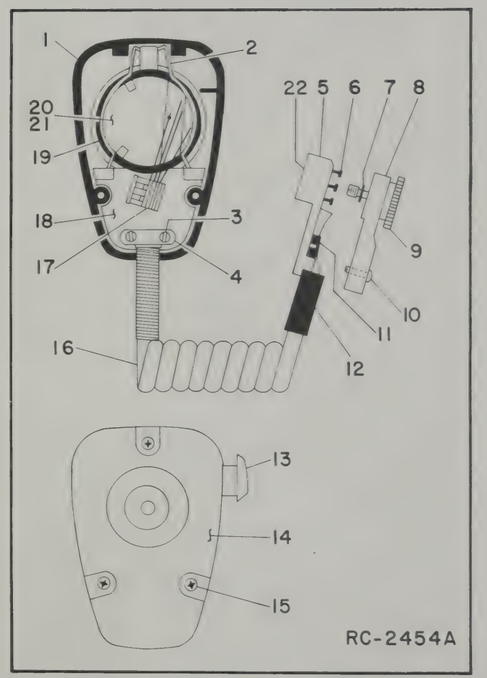
PARTS LIST

LBI4488C

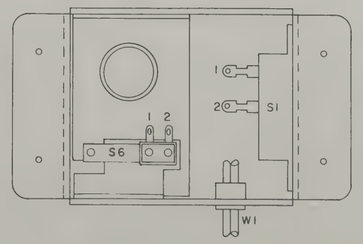
SPEAKER
19C320302G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - LOUDSPEAKERS - - - - - - - - - -
LS1	19A116694P1	Permanent magnet, 5 inch: 20 watts, 8 ohms ±10% imp, 100 to 10,000 Hz response; sim to Oaktron 5EU2189-2.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B219692G1	Grille.
	19B227593G1	Housing.
	19C320016P1	Mounting bracket. (Located between housing & retaining bracket).
	19C320022P1	Retaining bracket. (Located between mounting bracket & safety release disc).
	19B219578G1	Safety Release Disc.
	19A116986P108	Tap screw, with lockwasher: No. 7-19 x 1/2. (Secures speaker to housing).
	19A116986P112	Tap screw, with lockwasher: No. 7-19 x 3/4. (Secures grille to housing).
	N187P16010C6	Machine screw: No. 10-32 x 5/8. (Secures mounting bracket to housing- used with safety release disc, retaining bracket).
	N710P16012C6	Screw, hexhead, slotted: No. 10-16 x 3/4. (Quantity 3- used without safety release disc & retaining bracket).
	N187P16010C6	Machine screw, slotted: No. 10-32 x 5/8. (Used with safety release disc & retaining bracket).
	N130P16012C6	Tap screw, thd. forming: No. 10-16 x 3/4. (When mounting to regular surface).
	N130P16024C6	Tap Screw, thd. forming: No. 10-16 x 1-1/2. Slotted hex head. (When mounting to extra thick mounting surface).

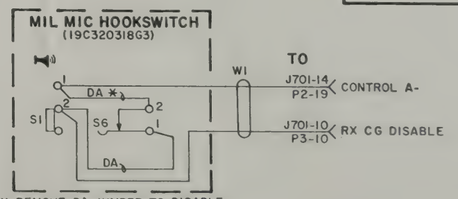
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



OUTLINE DIAGRAM



(19B227626, Rev. 0)



* REMOVE DA JUMPER TO DISABLE AUTOMATIC CHANNEL GUARD MONITOR
S6- SHOWN OFF HOOK
S1- SHOWN OFF MONITOR

(19A136836, Rev. 2)

MODEL NO.	REV LETTER

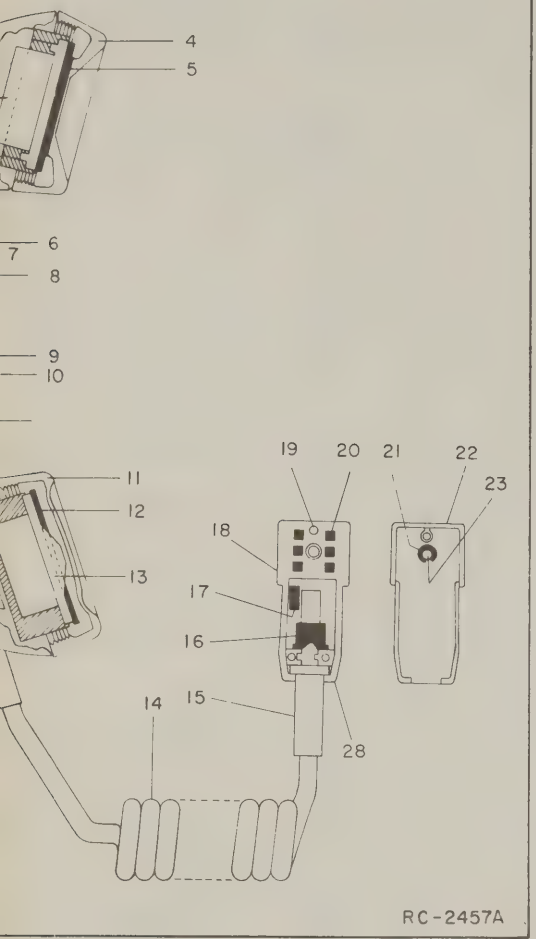
SERVICE SHEET

MICROPHONE & HOOKSWITCH

PARTS LIST

LBI4482E

TRANSISTORIZED DYNAMIC HANDSET
19C320478G5 MASTR II
19C320478G6 DELTA



ODUCTION CHANGES

improve performance or to simplify circuits are identified by a "Revision
r the model number of the unit. The revision stamped on the unit includes all
he Parts List for descriptions of parts affected by these revisions.

switch 19B219846G1
in initial shipment.

peration of handset when speaker is removed
. Changed R1.

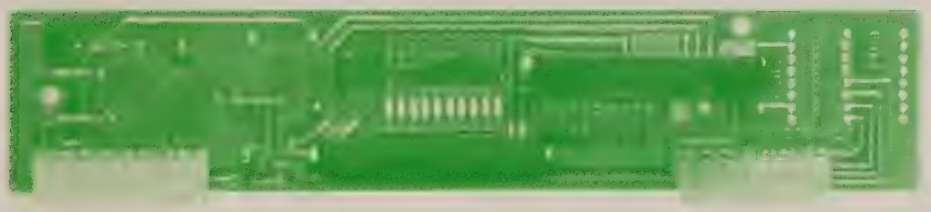
interference between R1 and R2.

SYMBOL	GE PART NO.	DESCRIPTION
1	RP142	Case Assembly. Includes items 1, 2, 4, 5, 11, 12, & 26.
2		Adapter. Part of item 1.
3	RP140	Receiver Cartridge.
4		Receiver Cap. Part of item 1.
5		Washer. Part of item 1.
6		Escutcheon. Part of item 27.
7		Flat head screw, socket cap: No. 4-40 x 1/4. Part of item 27.
8		Actuator. Part of item 27.
9		Spring. Part of item 27.
10		Plunger bar. Part of item 27.
11		Transmitter cap. Part of item 1.
12		Washer. Part of item 1.
13	RP139	Transmitter cartridge.
14	19C321016G2	Cable assembly: Includes items 14-25 and cable RP141.
15	19B219749P1	Flex relief.
16	19A116937P1	Cable clamp: sim to Malco 21012-3.
17	3R77P472K	Resistor, (R1) Composition: 4.7K ohms ±10%, 1/2 w. (G5 only).
	19A700019P43	Resistor, (R1) Deposited carbon: 3.3K ohms ±5%, 1/4 w. (G6 only).
18	19D416766P1	Connector case.
19	N136AP905Y6	Tap screw: No. 4-24 x 5/16.
20	19A129435P1	Pin contact.
21	19A701289P1	Retaining ring: 3/16 inches; sim to National Lockwasher WA 510.
22	19D416767P1	Connector Cover.
23	19B219723G1	Thumb screw: lexan. (Secures cover, item 22 to case, item 18).
24		Screw. Part of item 14.
25		Cable clamp. Part of item 14.
26		Shield. Part of item 1.
27	RP143	Switch Assembly. Includes items 6-10.
28	19C321016G3	Connector Assembly: Includes items 15, 16, 18-23. Does not include resistor, item 17.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

MOBILE RADIO

MASTR® II
MAINTENANCE MANUAL
PROGRAMMABLE CHANNEL GUARD 19D432500G1-3



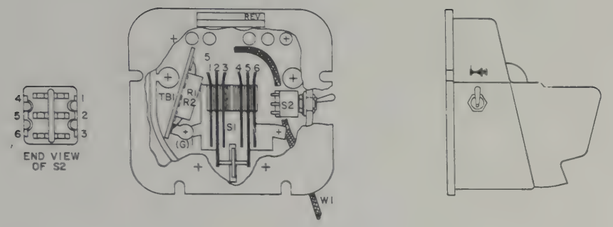
SPECIFICATIONS *

Input Voltage	10 Volts DC
Current Drain	50 Milliamperes Maximum
Frequency Range	67-210.7 Hz
Maximum Frequency	±0.2%
Encode Output Level	
67 Hz	0.8 Volts RMS Minimum
156 Hz	0.4 Volts RMS Minimum
210 Hz	0.2 Volts RMS Minimum
Encode Tone Distortion	1.5% Maximum
Programming Increments	0.25 Hz
Decode Input Level	45 Millivolts RMS Minimum
Decode Response Time	250 Milliseconds Maximum @ 100 Hz
PTT Delay	160 Milliseconds
STE Phase Shift	135°
Temperature Range	-30° C (-22° F) to +60° C (140° F)

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

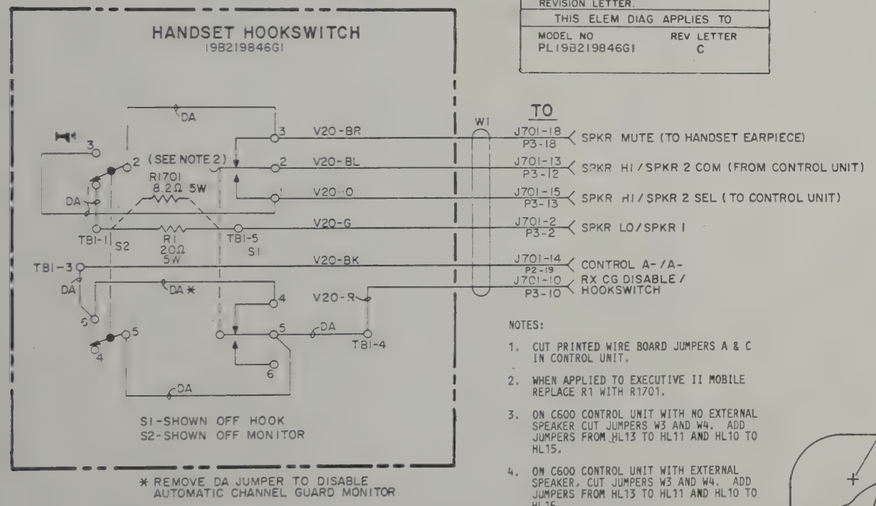
GENERAL ELECTRIC

OUTLINE DIAGRAM



(19B226131, Rev. 3)

SCHEMATIC DIAGRAM



* REMOVE DA JUMPER TO DISABLE AUTOMATIC CHANNEL GUARD MONITOR

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.	
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PLI9B219846G1	C

	TO	
V20-BR	J701-18 P3-18	SPKR MUTE (TO HANDSET EARPIECE)
V20-BL	J701-13 P3-12	SPKR HI/SPKR 2 COM (FROM CONTROL UNIT)
V20-O	J701-15 P3-13	SPKR HI/SPKR 2 SEL (TO CONTROL UNIT)
V20-G	J701-2 P3-2	SPKR LO/SPKR 1
V20-BK	J701-14 P2-19	CONTROL A-/A-
	J701-10 P3-10	RX CG DISABLE/ HOOKSWITCH
V20-R		

W1

NOTES:

1. CUT PRINTED WIRE BOARD JUMPERS A & C IN CONTROL UNIT.
2. WHEN APPLIED TO EXECUTIVE II MOBILE REPLACE R1 WITH R1701.
3. ON C600 CONTROL UNIT WITH NO EXTERNAL SPEAKER CUT JUMPERS W3 AND W4. ADD JUMPERS FROM HL13 TO HL11 AND HL10 TO HL15.
4. ON C600 CONTROL UNIT WITH EXTERNAL SPEAKER, CUT JUMPERS W3 AND W4. ADD JUMPERS FROM HL13 TO HL11 AND HL10 TO HL16.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

(19B219842, Rev. 10)

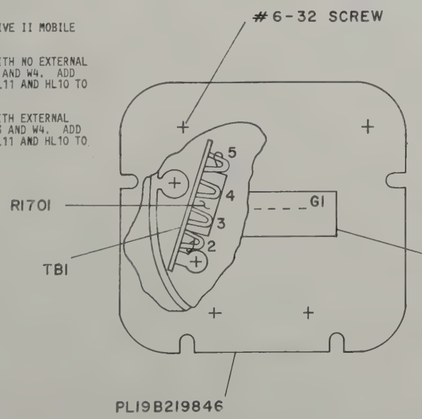
PARTS LIST

LBI4484H

HANDSET HOOKSWITCH
19B219846G1

SYMBOL	GE PART NO.	DESCRIPTION
		---------- RESISTORS ----------
R1*	5493035P55	Wirewound: 20 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
		In REV A:
	5493035P11	Wirewound; 40 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
		Earlier than REV A:
	5493035P12	Wirewound; 60 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
		---------- SWITCHES ----------
S1	19A129585G1	Holder and switch: Thermoplastic case, contact rating 1 amp at 125 v.
S2	19A700189P6	Toggle: DPDT, 5 amps at 28 VDC or 115 VAC; sim to C & K Components 7201G. (CHANNEL GUARD DISABLE).
		---------- TERMINAL BOARDS ----------
TB1	7775500P203	Phen: 5 terminals.
		---------- CABLES ----------
W1	19B219841G1	Cable: 6 conductor; approx 5 feet long.
		---------- MISCELLANEOUS ----------
	N190P1312C	Tap screw, phillips: No. 6-20 x 3/4. (Secures housing to base plate).
	N101P1510P	Tap screw, phillips: No. 8-15 x 5/8. (Used for mounting base plate).
	19A129586G1	Bumper, rubber. (2).
	19B219852P1	Base plate.
		EXECUTIVE II MODIFICATION KIT 19A136767G1
R1701	5493035P52	Resistor, wirewound: 8.2 ohms ±10%, 5 w; sim to Hamilton Hall Type HR.
	19A136775P1	Label.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



THESE INSTRUCTIONS COVER THE MODIFICATION OF MASTR II HANDSET HOOKSWITCH TO BE APPLIED TO EXEC II

INSTRUCTIONS:

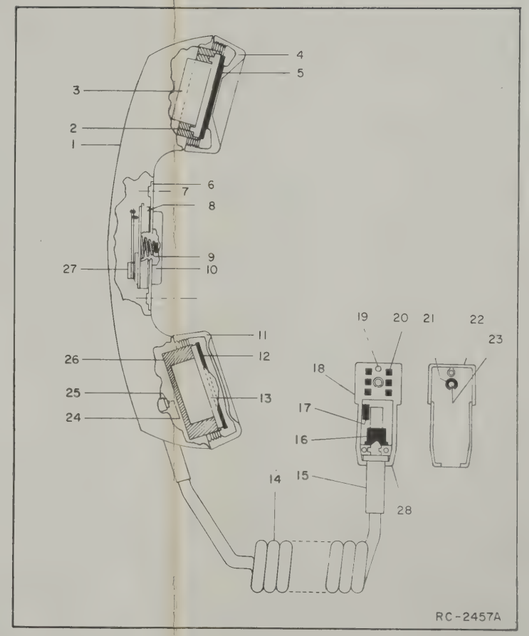
1. REMOVE FOUR #6-32 SCREWS AND COVER.
2. REMOVE R1 RESISTOR (40 OHM) AND DISCARD. REPLACE WITH R1701 RESISTOR (8.2 OHM) AND SOLDER TO TB1-5 AND TB1-2 AS SHOWN.
3. REPLACE COVER AND SCREWS.
4. ADD LABEL (19A136775) AS SHOWN.

(19B227530, Rev. 2)

PARTS LIST

LBI4482E

TRANSISTORIZED DYNAMIC HANDSET
19C320478G5 MASTR II
19C320478G6 DELTA



SYMBOL	GE PART NO.	DESCRIPTION
1	RP142	Case Assembly. Includes items 1, 2, 4, 5, 11, 12, & 26.
2		Adapter. Part of item 1.
3	RP140	Receiver Cartridge.
4		Receiver Cap. Part of item 1.
5		Washer. Part of item 1.
6		Escutcheon. Part of item 27.
7		Flat head screw, socket cap: No. 4-40 x 1/4. Part of item 27.
8		Actuator. Part of item 27.
9		Spring. Part of item 27.
10		Plunger bar. Part of item 27.
11		Transmitter cap. Part of item 1.
12		Washer. Part of item 1.
13	RP139	Transmitter cartridge.
14	19C321016G2	Cable assembly: Includes items 14-25 and cable RP141.
15	19B219749P1	Flex relief.
16	19A116937P1	Cable clamp: sim to Malco 21012-3.
17	3R77P472K	Resistor, (R1) Composition: 4.7K ohms ±10%, 1/2 w. (G5 only).
	19A700019P43	Resistor, (R1) Deposited carbon: 3.3K ohms ±5%, 1/4 w. (G6 only).
18	19D416766P1	Connector case.
19	N136AP905Y6	Tap screw: No. 4-24 x 5/16.
20	19A129435P1	Pin contact.
21	19A701289P1	Retaining ring: 3/16 inches; sim to National Lockwasher WA 510.
22	19D416767P1	Connector Cover.
23	19B219723G1	Thumb screw: lexan. (Secures cover, item 22 to case, item 18).
24		Screw. Part of item 14.
25		Cable clamp. Part of item 14.
26		Shield. Part of item 1.
27	RP143	Switch Assembly. Includes items 6-10.
28	19C321016G3	Connector Assembly: Includes items 15, 16, 18-23. Does not include resistor, item 17.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

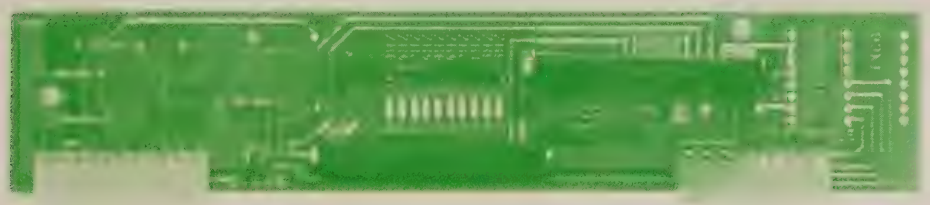
REV. A - Handset Hookswitch 19B219846G1
Incorporated in initial shipment.

REV. B - To improve operation of handset when speaker is removed from circuit. Changed R1.

REV. C - To eliminate interference between R1 and R2.

MOBILE RADIO

MASTR® II
MAINTENANCE MANUAL
PROGRAMMABLE CHANNEL GUARD 19D432500G1-3



SPECIFICATIONS *

Input Voltage	10 Volts DC
Current Drain	50 Milliamperes Maximum
Frequency Range	67-210.7 Hz
Maximum Frequency	±0.2%
Encode Output Level	
67 Hz	0.8 Volts RMS Minimum
156 Hz	0.4 Volts RMS Minimum
210 Hz	0.2 Volts RMS Minimum
Encode Tone Distortion	1.5% Maximum
Programming Increments	0.25 Hz
Decode Input Level	45 Millivolts RMS Minimum
Decode Response Time	250 Milliseconds Maximum @ 100 Hz
PTT Delay	160 Milliseconds
STE Phase Shift	135°
Temperature Range	-30° C (-22° F) to +60° C (140° F)

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

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CHANNEL GUARD STRAPPING 8

WARNING

Although the highest DC voltage in the unit is supplied by the vehicle battery, high current may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc. enough to cause burns. Be careful when working near energized circuits.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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U.S.A.

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DESCRIPTION

General Electric Channel Guard Modules 19D432500 are field programmable, synthesized single tone Channel Guard encoders/decoders for use with MASTR® II mobile radios.

The encode function provides continuous tone-coded modulation for the transmitter. The decode function is used with the receiver to eliminate all calls that are not tone coded with the proper Channel Guard (CG) frequency.

Three different Channel Guard boards are available:

- 19D432500G1 - single tone encode/decode
- 19D432500G2 - single tone encode only
- 19D432500G3 - single tone decode only

OPERATION

In mobile Channel Guard applications, a microphone hookswitch is supplied with the radio. The CG hookswitch is equipped with a CG disable switch.

Placing the disable hookswitch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the receive Channel Guard is disabled when the microphone is removed from the hookswitch.

In station applications, a desk microphone is available for use with Channel Guard. Pressing the MONITOR bar on the base of the desk microphone disables the CG decode function. This permits the channel to be monitored before sending a message.

CIRCUIT ANALYSIS

Channel Guard is a continuous-tone controlled squelch system that provides communications control in accordance with EIA standard RS-220-A. The basic Channel Guard system utilizes standard tone frequencies from 67 to 210.7 hertz with both the encoder and decoder operating on the same frequency. The standard Channel Guard tone frequencies are shown in the following chart.

STANDARD TONE FREQUENCIES				
67.0	88.5	107.2	131.8	167.9
71.9	91.5	110.9	136.5	173.8
74.4	94.8	114.8	141.3	179.9
77.0	97.4	118.8	146.2	186.2
79.7	100.0	123.0	151.4	192.8
82.5	103.5	127.3	156.7	203.5
85.4			162.2	210.7

The Channel Guard circuitry consists of frequency systhesizer U1001, encoder/decoder U1002/U1003, tone programming switch S1001 and associated discrete circuitry.

Frequency synthesizer U1001 includes the synthesizer IC and a 32,768 Hz reference crystal that provides the clock inputs for the encoder/decoder module. The clock inputs are required to produce the tone frequency and the digitally generated time delays for the DELAYED PTT and squelch tail elimination (STE) circuits.

Tone frequency programming is accomplished by setting the 10 station switch (S1001) for the proper binary input to the synthesizer. The switch can be set to produce any CG tone from 67 Hz to 210.7 Hz in 0.25 Hz increments. Complete instructions for setting the switch are contained in the Programming Instructions (see Table of Contents).

Encode/decode hybrid U1002 contains the encoder and decoder, a voice reject filter, STE circuit and the interface circuitry. The interface circuitry provides increased output drive for RX MUTE, DELAYED PTT (Push-To-Talk) and other functions. Encode hybrid U1003 has the decoder removed for encode only operation.

ENCODE MODE

Depressing the PTT switch applies a low (A-) to PTT lead J908-6. This causes the DELAYED PTT lead (J908-8) to go low, keying the transmitter. The encoder then generates the CG tone which is applied to a low pass filter to remove any tone or clock harmonics. The filter output is then coupled through J908-7 to the transmitter.

NOTE

When jumper W1003 is connected, the tone output has a 6 dB/octave de-emphasis required for phase modulated transmitters. Jumper W1003 is removed for direct FM transmitters.

When the PTT button on the microphone is released (transmitter unkeyed), the DELAYED PTT circuit in U1002/U1003 keeps the transmitter keyed for an additional 160 milliseconds. During the 160 milliseconds delay time, the encoder shifts the phase of the CG tone output 135°. This combination of 160 milliseconds delay and the 135° phase shift causes the CG decoder in other receivers to squelch the audio before the loss of RF signal, eliminating the receiver noise burst (squelch tail elimination).

The encoder circuit can be disabled to allow the serviceman to make transmitter distortion and modulation checks. To disable the encoder, apply a ground to J908-2.

DECODE MODE

In the receive mode, receiver audio from VOLUME/SQUELCH HI lead J908-1 is applied to a voltage divider (R1002 and R1003) and then to a voice reject filter in the decode circuit. The filter removes any voice information to prevent voice blocking of clipping.

The digital decoder compares the frequency of the incoming tone to a reference clock input produced by the synthesizer. If the correct tone is detected, the decoder circuit causes the REC MUTE lead at J908-5 to go high, unsquelching the receiver. The REC MUTE lead is normally held in a low voltage condition until a correct CG tone is detected.

After the CG tone is decoded, the decoder then waits for a phase shift in the tone to occur. When the phase shift occurs, the STE delay circuit in the decoder pulls the REC MUTE lead to a low voltage state. This squelches the receiver for 200 milliseconds and keeps the receiver squelched until the RF carrier applied to the receiver is removed.

The decode circuit can be disabled by grounding J908-3.

MAINTENANCE

Troubleshooting the Channel Guard assembly is facilitated when using the Channel Guard extender board (19C320966G1). The extender board contains three slide switches which disable the decode and encode circuitry, and also bridges the PTT input to the delayed PTT output when the CG board is removed. In addition, "test points" are provided for all pins on J908.

PTT Bridge - Allows the transmitter to be keyed when the channel guard board is removed. Note: If transmitter is keyed with Channel Guard installed and PTT bridge closed the channel guard PTT delay will lock up until PTT bridge is opened.

Encode Disable - Applies A- to pin 2 of J908 and Pin 11 of the Encode IC to prevent transmitting the Channel Guard Tone.

Rx CG Disable - Applies A- to J908-3 and pin 2 of the Decode IC to disable the decoder. Under this condition the receiver is not muted.

A troubleshooting chart provides a method of checking the Channel Guard functions.

INSTALLATION

IN MOBILE RADIOS

To install Channel Guard in radios not previously equipped with this feature, proceed as follows:

1. Gain access to System Board and clip out the DA jumper wire between H71 and H72 on the System Board (Refer to the MASTR II Maintenance Manual for the Front Panel and System Board.)
2. Plug the Channel Guard unit into J908 and J909 on the System Board.
3. Install the hookswitch to the control unit as directed in the Control Unit Maintenance Manual.
4. Adjust transmitter deviation in accordance with the Alignment Procedures in the Transmitter Maintenance Manual. No other adjustments are required.

IN STATIONS

Refer to the Station Combination Maintenance Manual for installation instructions.

CHANNEL GUARD STRAPPING

When an "open" channel is required on a multi-frequency radio, the encode/decode function on the Channel Guard board must be disabled for each "open" channel. This modification may be incorporated into any of the Channel Guard boards.

Refer to the Schematic Diagram and Strapping Diagram for strapping instructions.

REMOVING INTEGRATED CIRCUITS

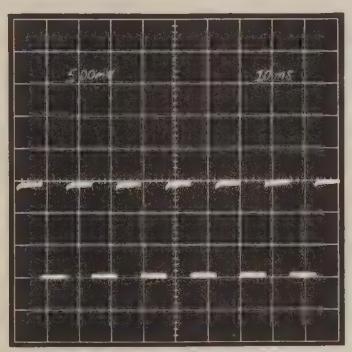
Removing IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

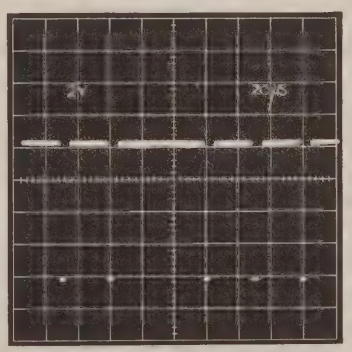
TROUBLESHOOTING PROCEDURE

Before starting the TROUBLESHOOTING PROCEDURE, check to see that +10 volts and ground are connected to the Channel Guard board.

SYMPTOM	PROCEDURE
No Encode Tone	Check the PTT lead for a "low" (0.7 volt or less). Next, check the TX CG DSBL lead for 1.5 to 5 volts. If a "low" is not present on the PTT lead check the microphone and hookswitch circuits. If a "high" is present on the TX CG DISABLE lead, check the DELAY CLOCK output at U1001-9 for 64 Hz and the TONE CLOCK output at U1001-8 for 256 times the Channel Guard (CG) frequency. EXAMPLE: If the CG frequency is 100 Hz, the TONE CLOCK output should be 25,600 Hz (see waveforms below).
Encode Disable (Tone present when CG disabled)	If either clock output is not present, replace U1001. If both clock outputs are correct, check U1001-5 for a tone output. If no tone is present, replace U1002/U1003. Key the microphone and check for a tone output at J908-7. If no tone output, make the checks listed for "No Encode Tone". If tone is present, ground the TX CG DSBL lead (J908-3). Tone should not be present at CG HI lead. If tone is present, replace U1002/U1003.
No Decode (Receiver won't unsquelch)	With the correct CG tone applied and the CG DSBL lead high (or open), the REC MUTE lead should be "high". If not, check the clock outputs at U1003-8(256 x CG Freq.) and U1003-9 (64 Hz). If clock outputs are incorrect, perform the steps called for in "Wrong Encode or Decode Tone".
Decode Disable (Receiver won't unsquelch with CG disabled)	With the correct CG tone applied to VOL/SQ HI, the REC MUTE lead should go "high". Next, ground the CG DSBL input J908-3 and check to see that the RX MUTE lead goes "high" (approx. 10 volts). If the REC MUTE lead does not go "high", replace U1001.
Wrong Encode or Decode Tone	Check to determine that S1001 is programmed for the correct CG frequency (refer to the FREQUENCY PROGRAMMING INSTRUCTIONS listed in the Table of Contents). If S1001 is set correctly, check the tone programming pins at U1001-2 thru -7 and -10 thru -13. NOTE: Logic "1" is approx. supply voltage and logic "0" is approx. A-. If logic readings correspond to S1001 settings, replace U1002/U1003. If readings do not correspond to S1001 settings, replace S1001.
Squelch Tail Present (no STE)	When the PTT lead is "low", P1005-8 should be "low". When the PTT lead goes "high" (PTT released), the PTT DELAYED lead should remain "low" for an additional 160 milliseconds. If not, replace U1002/U1003.

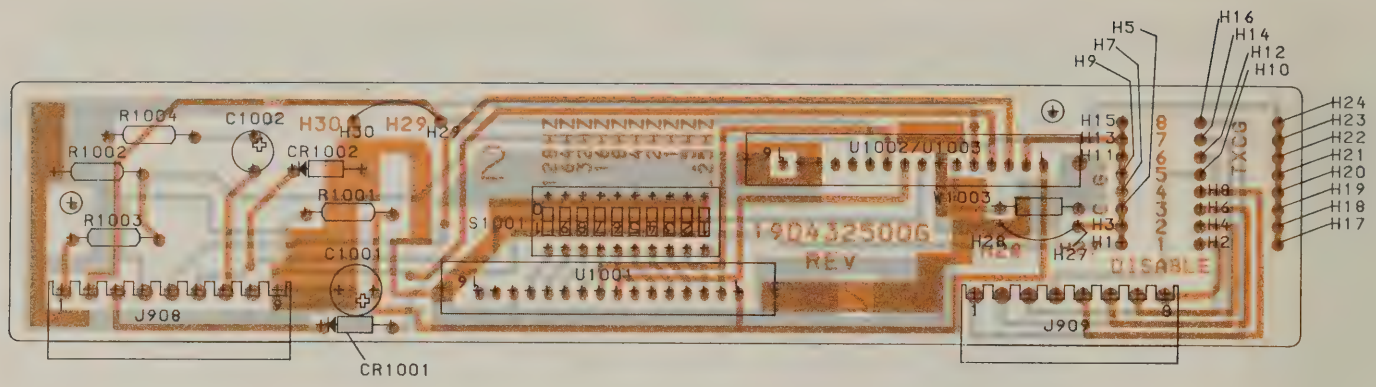


64 Hz Clock

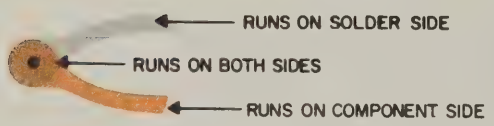


256 X CG Tone (Tone = 100 Hz)

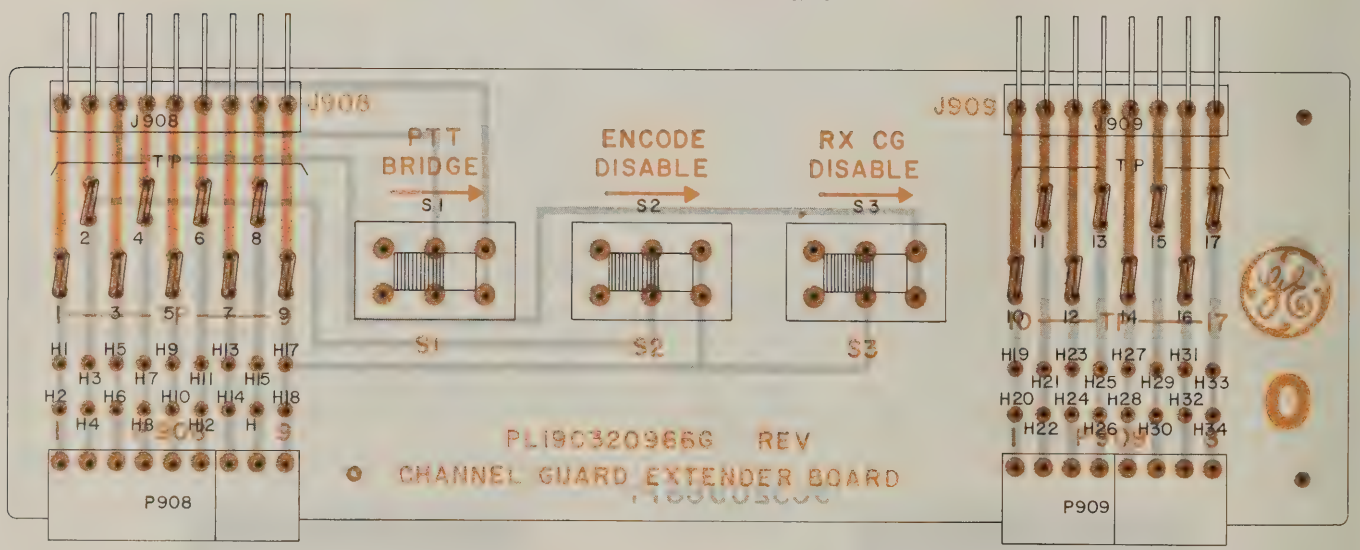
CHANNEL GUARD



(19D432506, Rev. 1)
(19A143571, Sh. 1, Rev. 2)
(19A143571, Sh. 2, Rev. 2)



CHANNEL GUARD EXTENDER BOARD



(19C321121, Rev. 0)
(19C320968, Sh. 2, Rev. 0)
(19C320968, Sh. 3, Rev. 0)

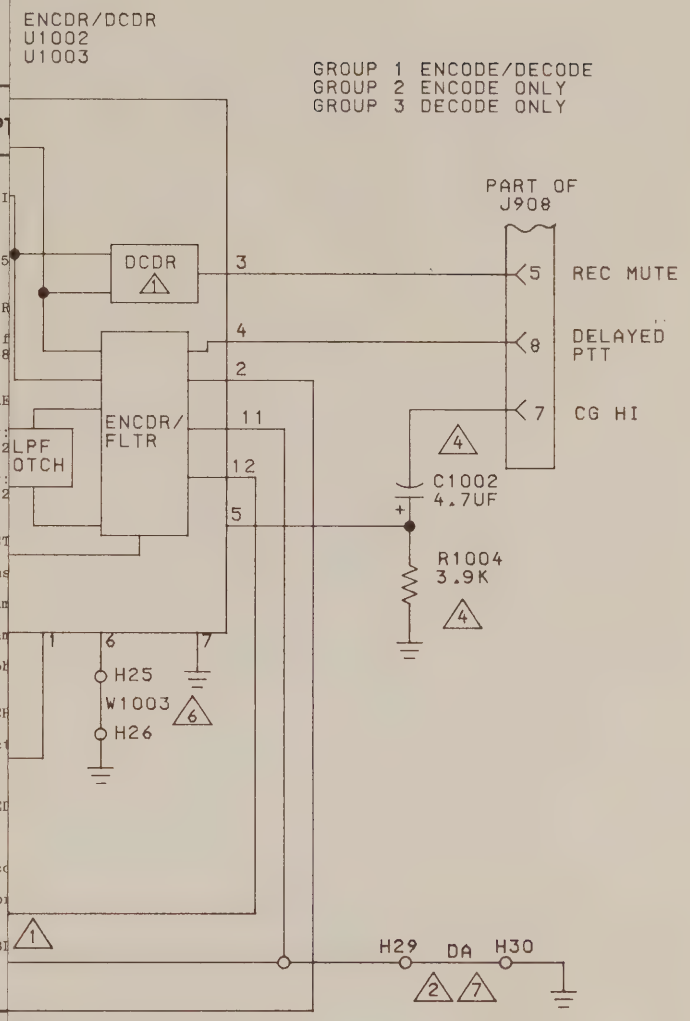
OUTLINE DIAGRAMS

CHANNEL GUARD AND
CHANNEL GUARD EXTENDER BOARD

CHANNEL GUARD ENCODER/DECODER
19D432500G1 ENCODE/DECODE - REV B
19D432500G2 ENCODE ONLY - REV B
19D432500G3 DECODE ONLY - REV A
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPT
		- - - - - - - - - - CAPACI
C1001	19A700003P8	Tantalum: 22 uF ±20%, 16
C1002	19A700003P6	Tantalum: 4.7 uF ±20%, 35
		- - - - - - - DIODES AND R
CR1001 and CR1002	19A700028P1	Silicon, fast recovery: f 75 PIV; sim to Type 1N4148
		- - - - - - - JACKS AND RE
J908	19A116659P76	Connector, printed wiring: 5 amps; sim to Molex 09-52
J909	19A116659P77	Connector, printed wiring: 5 amps; sim to Molex 09-52
		- - - - - - - - - - RESIST
R1001	19A700019P13	Deposited carbon: 10 ohms
R1002	19A700019P50	Deposited carbon: 12K ohm
R1003	19A700019P57	Deposited carbon: 47K ohm
R1004	19A700019P44	Deposited carbon: 3.9K oh
		- - - - - - - - - - SWITCH
S1001	19B800010P1	Push: 10 station, contact sim to CTS 206-10.
		- - - - - - - - INTEGRATED
U1001	19D900260G1	Frequency Synthesizer.
U1002	19D900496G1	Channel Guard, Encode/Dec
U1003	19D900496G2	Channel Guard, Encode Hyb
		- - - - - - - - - - - CABI
W1003	19A700184P1	Jumper.

*COMPONENTS ADDED, DELETED OR CHANGED BY PI



ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

REV. LETTER
B
B
A

PRODUCTION CHANG

Changes in the equipment to improve performance or to simplify circuits Letter," which is stamped after the model number of the unit. The revision s previous revisions. Refer to the Parts List for descriptions of parts affe

REV. A - Channel Guard Encoder/Decoder 19D432500G1-G3
Incorporated in original shipment.

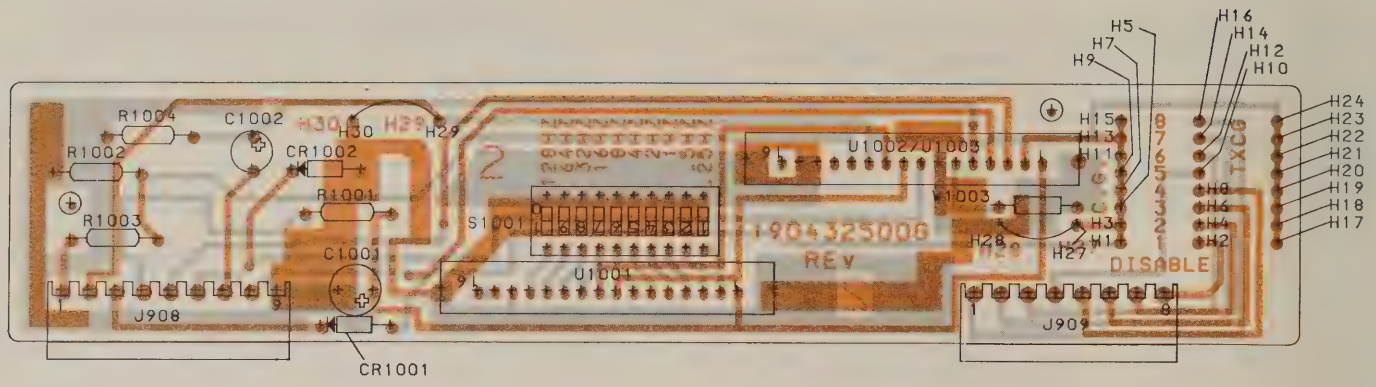
REV. B - 19D432500G1,2 Channel Guard Encoder/Decoder

To provide similiar tone output levels for s tone and multitone synthesized channel guard Changed R1004 to 3.9K ohms. Old part number R1004 was:
19A700019P45- Deposited carbon: 4.7K ohms ±5

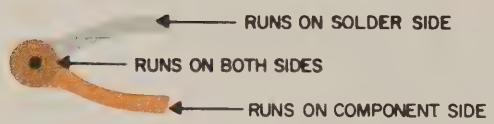
SCHEMATIC DIAGRAM

CHANNEL GUARD

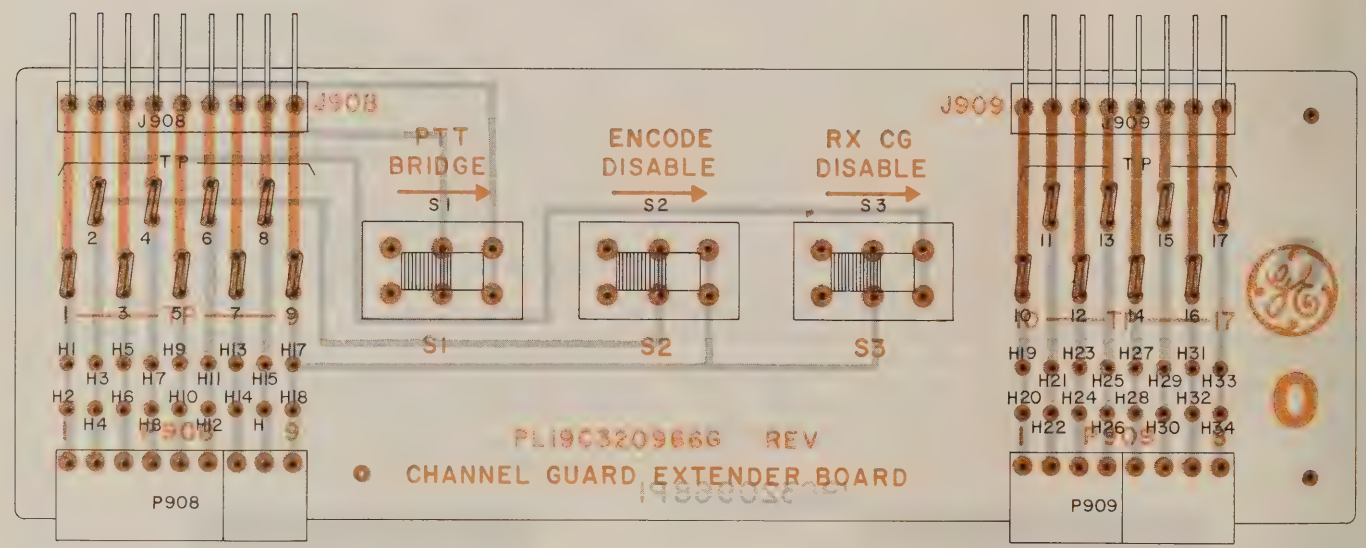
CHANNEL GUARD



(19D432506, Rev. 1)
(19A143571, Sh. 1, Rev. 2)
(19A143571, Sh. 2, Rev. 2)



CHANNEL GUARD EXTENDER BOARD



(19C321121, Rev. 0)
(19C320968, Sh. 2, Rev. 0)
(19C320968, Sh. 3, Rev. 0)

OUTLINE DIAGRAMS

CHANNEL GUARD AND
CHANNEL GUARD EXTENDER BOARD

PARTS LIST

CHANNEL GUARD ENCODER/DECODER
19D432500G1 ENCODE/DECODE - REV B
19D432500G2 ENCODE ONLY - REV B
19D432500G3 DECODE ONLY - REV A
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1001	19A700003P8	Tantalum: 22 uF ±20%, 16 VDCW.
C1002	19A700003P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1001 and CR1002	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J908	19A116659P76	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-52-3091.
J909	19A116659P77	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-52-3081.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1001	19A700019P13	Deposited carbon: 10 ohms ±5%, 1/4 w.
R1002	19A700019P50	Deposited carbon: 12K ohms ±5%, 1/4 w.
R1003	19A700019P57	Deposited carbon: 47K ohms ±5%, 1/4 w.
R1004	19A700019P44	Deposited carbon: 3.9K ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1001	19B800010P1	Push: 10 station, contacts rated 25 mA at 24 VDC; sim to CTS 206-10.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1001	19D900260G1	Frequency Synthesizer.
U1002	19D900496G1	Channel Guard, Encode/Decode Hybrid.
U1003	19D900496G2	Channel Guard, Encode Hybrid.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1003	19A700184P1	Jumper.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - Channel Guard Encoder/Decoder 19D432500G1-G3
Incorporated in original shipment.

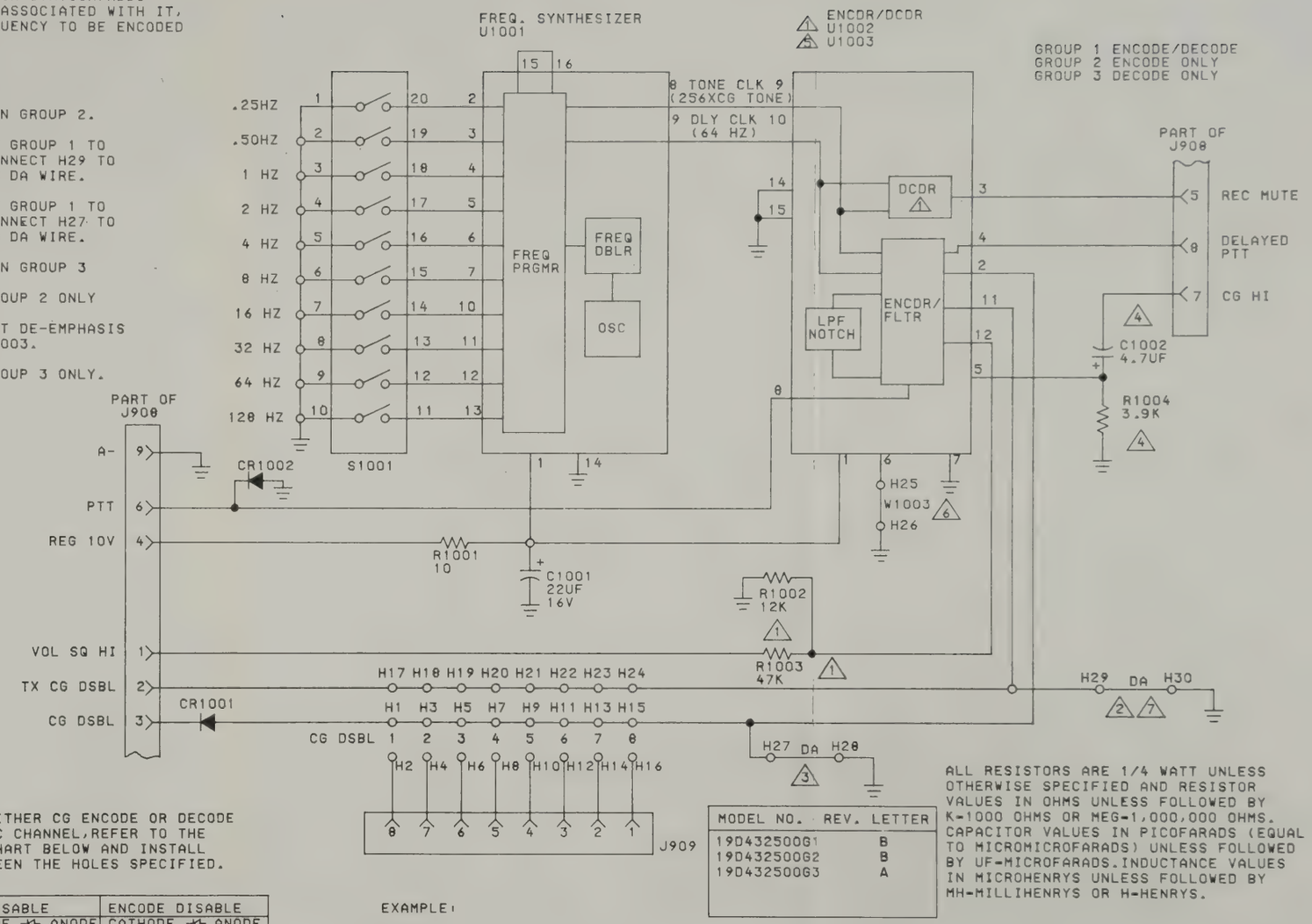
REV. B - 19D432500G1,2 Channel Guard Encoder/Decoder

To provide similiar tone output levels for single tone and multitone synthesized channel guard units. Changed R1004 to 3.9K ohms. Old part number for R1004 was:
19A700019P45- Deposited carbon: 4.7K ohms ±5%, 1/4 W.

OPENING A SWITCH STATION, ADDS THE FREQUENCY ASSOCIATED WITH IT, TO THE CG FREQUENCY TO BE ENCODED OR DECODED.

NOTES:

1. NOT USED IN GROUP 2.
2. TO CONVERT GROUP 1 TO GROUP 3 CONNECT H29 TO H30, USING DA WIRE.
3. TO CONVERT GROUP 1 TO GROUP 2 CONNECT H27 TO H28, USING DA WIRE.
4. NOT USED IN GROUP 3
5. USED IN GROUP 2 ONLY
6. FOR 6dB/OCT DE-EMPHASIS INSTALL W1003.
7. USED IN GROUP 3 ONLY.



MODEL NO.	REV. LETTER
19D432500G1	B
19D432500G2	B
19D432500G3	A

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

TO DISABLE EITHER CG ENCODE OR DECODE ON A SPECIFIC CHANNEL, REFER TO THE APPROPIATE CHART BELOW AND INSTALL A DIODE BETWEEN THE HOLES SPECIFIED.

	DECODE DISABLE		ENCODE DISABLE	
CHANNEL	CATHODE -K-	ANODE	CATHODE -K-	ANODE
1	H2	H1	H2	H17
2	H4	H3	H4	H18
3	H6	H5	H6	H19
4	H8	H7	H8	H20
5	H10	H9	H10	H21
6	H12	H11	H12	H22
7	H14	H13	H14	H23
8	H16	H15	H16	H24

EXAMPLE:

TO DISABLE CG DECODE, TO MAKE AN "OPEN" CHANNEL, ON CHANNEL 3, INSTALL THE CATHODE OF A DIODE IN HOLE 6, AND THE ANODE IN HOLE 5.

IT IS POSSIBLE TO DISABLE BOTH ENCODE AND DECODE, BY INSTALLING BOTH DIODES.

(19C330976, Rev. 3)

SCHEMATIC DIAGRAM

CHANNEL GUARD

PARTS LIST

LBI4626A

CHANNEL GUARD EXTENDER BOARD
19C320966G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J908	19A116659P31	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-66-1091.
J909	19A116659P30	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-66-1081.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P908		Includes:
	19A700102P1	Printed wire: 3 contacts rated at 5 amps; sim to Molex 09-52-3031.
	19A116659P6	Connector, printed wiring: 6 contacts rated @ 5 amps; sim to Molex 09-52-3061.
P909	19A116659P7	Connector, printed wire: 4 contacts rated at 5 amps; sim to Molex 09-51-3041. (Quantity 2).
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 thru S3	19B209261P14	Slide: DPDT, 2 poles, 2 positions, 1/2 amp VDC or 3 amps VAC at 125 V; sim to Switchcraft 11A-1413.
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP17	19B211379P1	Spring (Test Point).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

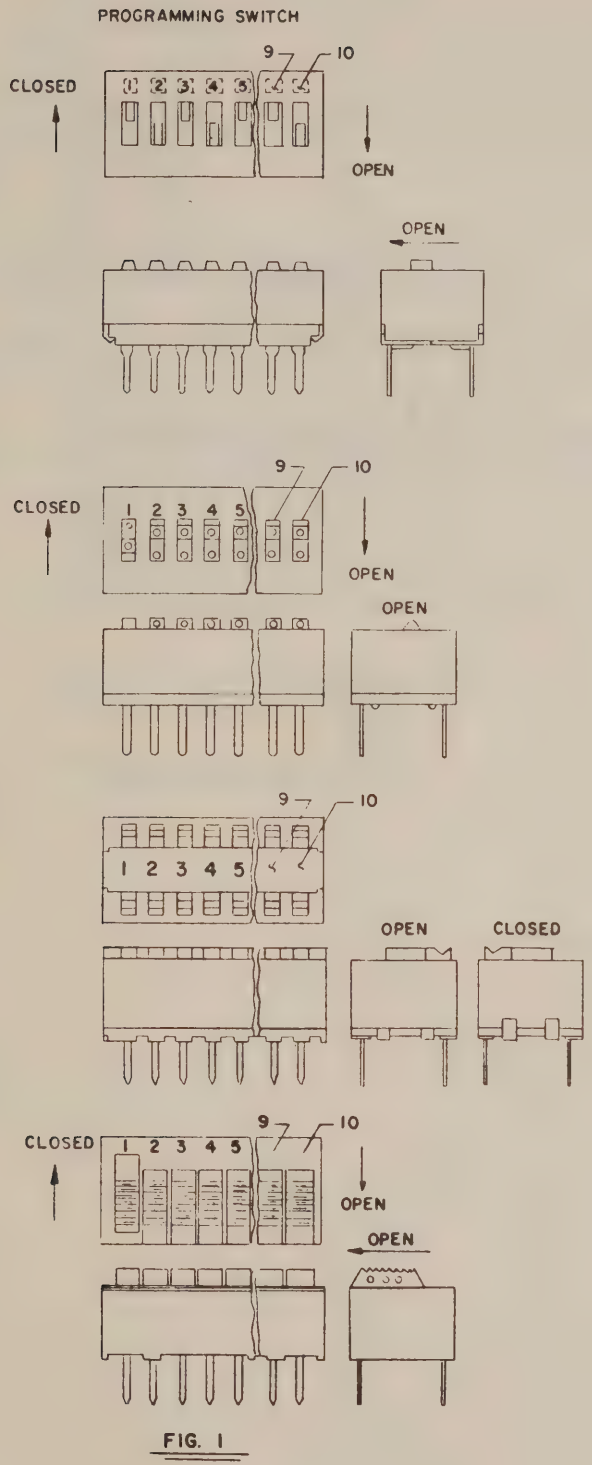


FIG. 1

1. TO PROGRAM A STANDARD CHANNEL GUARD FREQUENCY FROM THE CHART, OPEN EACH SWITCH STATION INDICATED BY AN "X", CLOSE EACH SWITCH STATION INDICATED BY A BLANK. SEE FIG 1.

2. TO PROGRAM A NEW STANDARD FREQUENCY, USE THE ÷2 BINARY FORMULA, PLUS THE FRACTIONAL BITS. STATIONS 1-10 REPRESENT BINARY DIGITS FROM 0.25 TO 128, I.E., 0.25, 0.5, 1,2,4,... 128. FOR EACH "ONE" CALCULATED BY THE ÷2 FORMULA, OPEN THE CORRESPONDING SWITCH STATIONS.

FOR EXAMPLE, TO DETERMINE SWITCH SETTING FOR 134.7 Hz.
SET STATIONS 1, 2 FROM THE FRACTIONAL PART CHART SET STATIONS 3-10 BY THE ÷2 FORMULA

	REMAINDER	STATION
134÷2= 67	0	3
67÷2= 33	1	4
33÷2= 16	1	5
16÷2= 8	0	6
8÷2= 4	0	7
4÷2= 2	0	8
2÷2= 1	0	9
1÷2= 0	1	10

FIRST DIVISION ALWAYS CORRESPONDS TO SWITCH STATION 3

THUS THE SWITCH SETTING FOR 134.7 Hz IS

1	2	3	4	5	6	7	8	9	10
X	X		X	X					X

WHERE "X" INDICATES AN OPEN STATION.

FRACTIONAL PART CHART

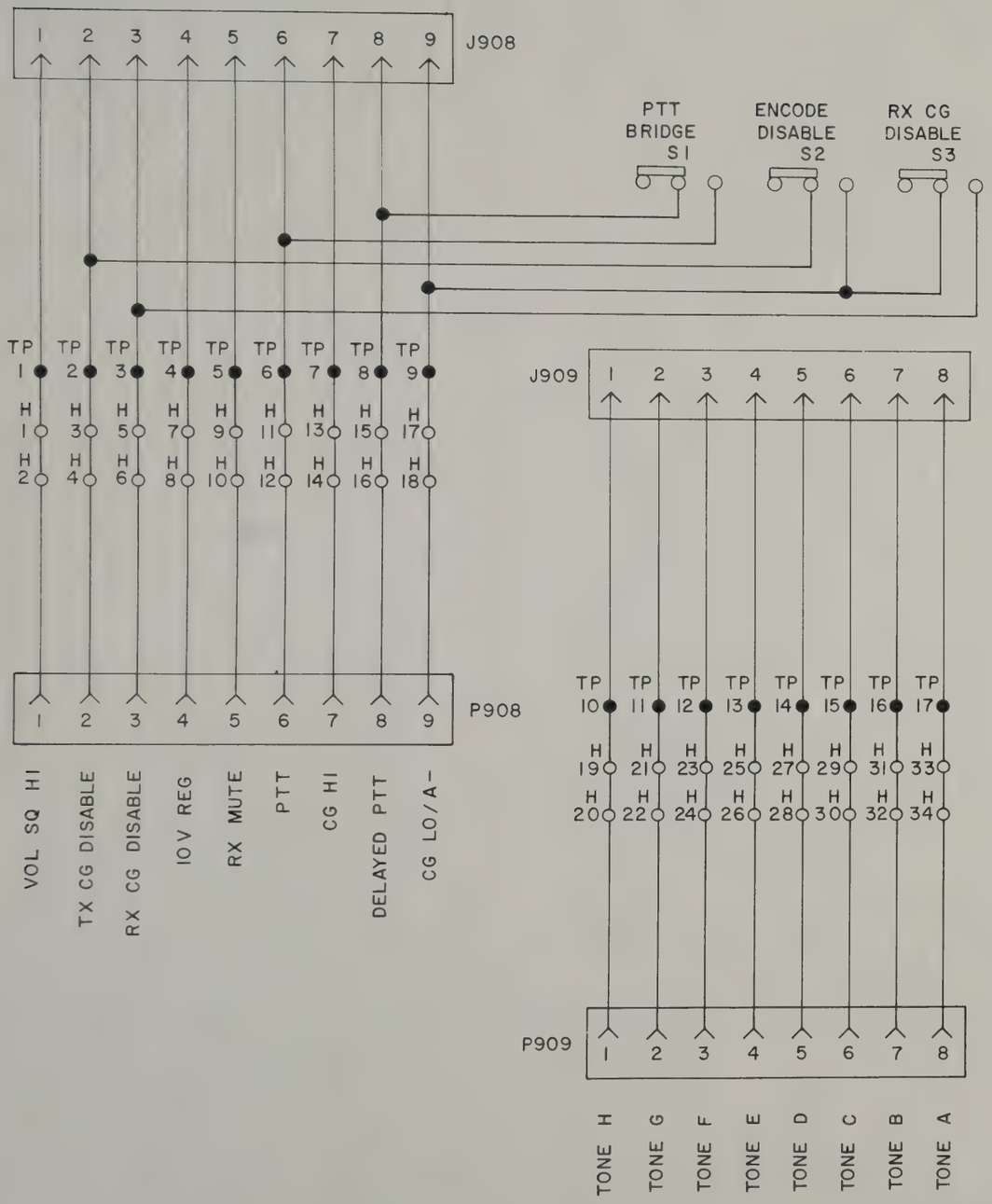
FROM TO	STA. 1	STA. 2
0.00-0.12		
0.13-0.37	X	
0.38-0.62		X
0.63-0.87	X	X
*0.88-0.99		

BY INSPECTION, 0.7 IS BETWEEN 0.63 AND 0.87, OPEN STATIONS 1, 2.

*IF FRACTIONAL PART IS BETWEEN 0.88 AND 0.99, SET STATIONS 1 AND 2 AS ABOVE AND ROUND FREQUENCY UP TO THE NEXT HIGHER INTEGER. (I.E. FOR 179.9 Hz, PROGRAM AS IF FREQUENCY WAS 180 Hz)

FREQ.	SWITCH STATIONS 1	2	3	4	5	6	7	8	9	10
67			X	X					X	
71.9						X			X	
74.4		X		X		X			X	
77			X		X	X			X	
79.7	X	X	X	X	X	X			X	
82.5		X		X			X		X	
85.4		X	X		X		X		X	
88.5		X				X	X		X	
91.5		X	X	X		X	X		X	
94.8	X	X		X	X	X	X		X	
100					X			X	X	
103.5		X	X	X	X			X	X	
107.2	X		X	X		X		X	X	
110.9			X	X	X	X		X	X	
114.8	X	X		X			X	X	X	
118.8	X	X		X	X		X	X	X	
123.0			X	X		X	X	X	X	
127.3	X		X	X	X	X	X	X	X	
131.8	X	X	X	X						X
136.5		X				X				X
141.3	X		X		X	X				X
146.2	X			X			X			X
151.4		X	X	X	X		X			X
156.7	X	X			X	X	X			X
162.2	X			X				X		X
167.9						X		X		X
173.8	X	X	X		X	X		X		X
179.9					X		X	X		X
186.2	X			X		X	X	X		X
192.8	X	X							X	X
203.5		X	X	X		X			X	X
210.7	X	X		X			X		X	X

(19C850733, Rev. 4)


J908
1 2 3 4 5 6 7 8 9
PTT BRIDGE S1
ENCODE DISABLE S2
RX CG DISABLE S3
TP 1 TP 2 TP 3 TP 4 TP 5 TP 6 TP 7 TP 8 TP 9
H 1 H 3 H 5 H 7 H 9 H 11 H 13 H 15 H 17
H 2 H 4 H 6 H 8 H 10 H 12 H 14 H 16 H 18
P908
1 2 3 4 5 6 7 8 9
VOL SQ HI
TX CG DISABLE
RX CG DISABLE
10 V REG
RX MUTE
PTT
CG HI
DELAYED PTT
CG LO/A-
J909
1 2 3 4 5 6 7 8
TP 10 TP 11 TP 12 TP 13 TP 14 TP 15 TP 16 TP 17
H 19 H 21 H 23 H 25 H 27 H 29 H 31 H 33
H 20 H 22 H 24 H 26 H 28 H 30 H 32 H 34
P909
1 2 3 4 5 6 7 8
TONE H
TONE G
TONE F
TONE E
TONE D
TONE C
TONE B
TONE A

SCHEMATIC DIAGRAM

CHANNEL GUARD EXTENDER BOARD

(19C321026, Rev. 1)

PARTS LIST

LBI4626A

CHANNEL GUARD EXTENDER BOARD
19C320966G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J908	19A116659P31	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-66-1091.
J909	19A116659P30	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-66-1081.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P908		Includes:
	19A700102P1	Printed wire: 3 contacts rated at 5 amps; sim to Molex 09-52-3031.
	19A116659P6	Connector, printed wiring: 6 contacts rated @ 5 amps; sim to Molex 09-52-3061.
P909	19A116659P7	Connector, printed wire: 4 contacts rated at 5 amps; sim to Molex 09-51-3041. (Quantity 2).
		- - - - - - - - - - - SWITCHES - - - - - - - - - - -
S1 thru S3	19B209261P14	Slide: DPDT, 2 poles, 2 positions, 1/2 amp VDC or 3 amps VAC at 125 V; sim to Switchcraft 11A-1413.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP17	19B211379P1	Spring (Test Point).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

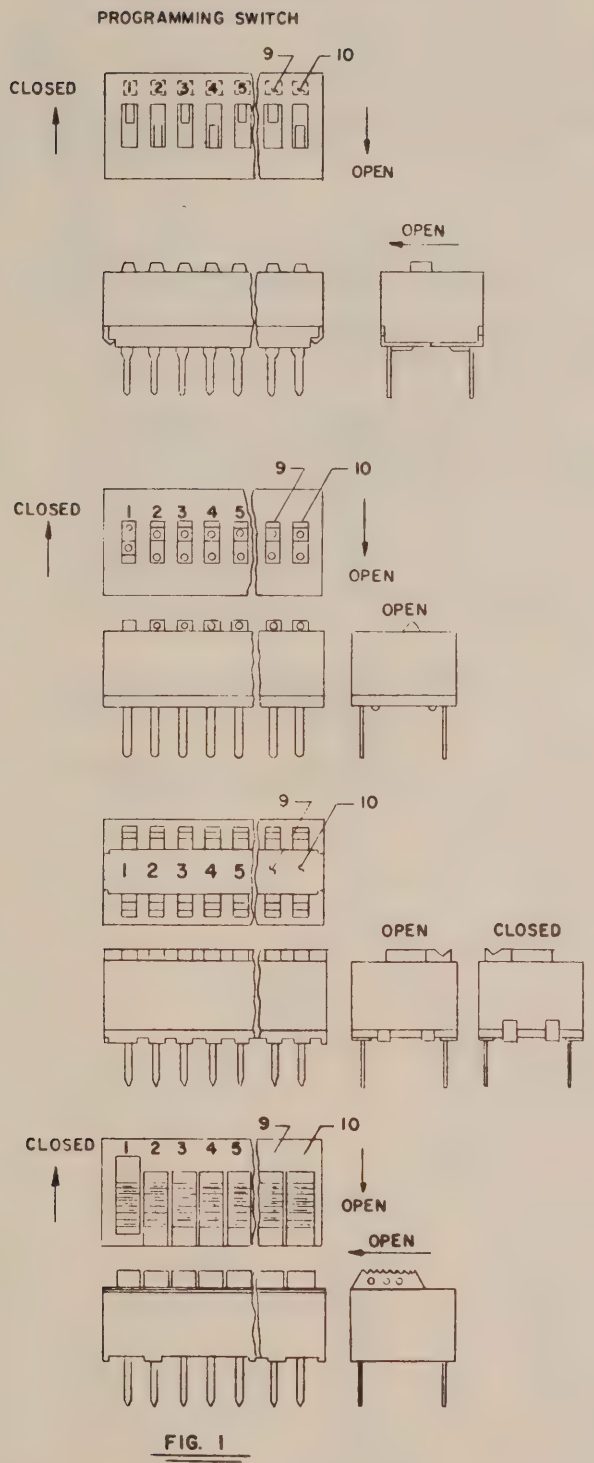


FIG. 1

1. TO PROGRAM A STANDARD CHANNEL GUARD FREQUENCY FROM THE CHART, OPEN EACH SWITCH STATION INDICATED BY AN "X". CLOSE EACH SWITCH STATION INDICATED BY A BLANK. SEE FIG 1.

2. TO PROGRAM A NEW STANDARD FREQUENCY, USE THE ÷2 BINARY FORMULA, PLUS THE FRACTIONAL BITS. STATIONS 1-10 REPRESENT BINARY DIGITS FROM 0.25 TO 128, I.E., 0.25, 0.5, 1,2,4,... 128. FOR EACH "ONE" CALCULATED BY THE ÷2 FORMULA, OPEN THE CORRESPONDING SWITCH STATIONS.

FOR EXAMPLE, TO DETERMINE SWITCH SETTING FOR 134.7 Hz.
SET STATIONS 1, 2 FROM THE FRACTIONAL PART CHART SET STATIONS 3-10 BY THE ÷2 FORMULA

	REMAINDER	STATION
134÷2= 67	0	3
67÷2= 33	1	4
33÷2= 16	1	5
16÷2= 8	0	6
8÷2= 4	0	7
4÷2= 2	0	8
2÷2= 1	0	9
1÷2= 0	1	10

FIRST DIVISION ALWAYS CORRESPONDS TO SWITCH STATION 3

THUS THE SWITCH SETTING FOR 134.7 Hz IS

1	2	3	4	5	6	7	8	9	10
X	X		X	X					X

WHERE "X" INDICATES AN OPEN STATION.

FRACTIONAL PART CHART

FROM TO	STA. 1	2
0.00-0.12		
0.13-0.37	X	
0.38-0.62		X
0.63-0.87	X	X
*0.88-0.99		

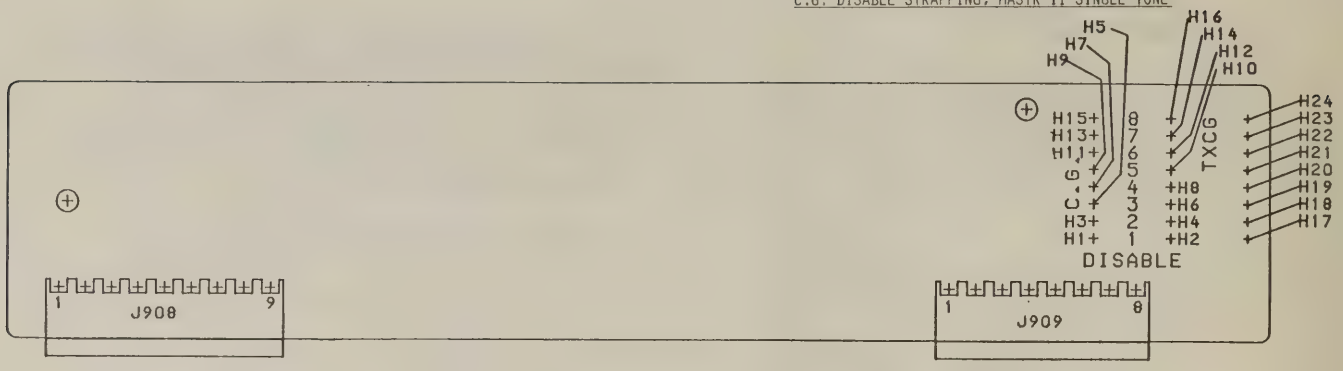
BY INSPECTION, 0.7 IS BETWEEN 0.63 AND 0.87, OPEN STATIONS 1, 2.

*IF FRACTIONAL PART IS BETWEEN 0.88 AND 0.99, SET STATIONS 1 AND 2 AS ABOVE AND ROUND FREQUENCY UP TO THE NEXT HIGHER INTEGER. (I.E. FOR 179.9 Hz, PROGRAM AS IF FREQUENCY WAS 180 Hz)

FREQ.	SWITCH STATIONS 1	2	3	4	5	6	7	8	9	10
67			X	X					X	
71.9						X			X	
74.4		X		X		X			X	
77			X		X	X			X	
79.7	X	X	X	X	X	X			X	
82.5		X		X			X		X	
85.4		X	X		X		X		X	
88.5		X				X	X		X	
91.5		X	X	X		X	X		X	
94.8	X	X		X	X	X	X		X	
100					X			X	X	
103.5		X	X	X	X			X	X	
107.2	X		X	X		X		X	X	
110.9			X	X	X	X		X	X	
114.8	X	X		X			X	X	X	
118.8	X	X		X	X		X	X	X	
123.0			X	X		X	X	X	X	
127.3	X		X	X	X	X	X	X	X	
131.8	X	X	X	X						X
136.5		X				X				X
141.3	X		X		X	X				X
146.2	X			X			X			X
151.4		X	X	X	X		X			X
156.7	X	X			X	X	X			X
162.2	X			X				X		X
167.9						X		X		X
173.8	X	X	X		X	X		X		X
179.9					X		X	X		X
186.2	X			X		X	X	X		X
192.8	X	X							X	X
203.5		X	X	X		X			X	X
210.7	X	X		X			X		X	X

(19C850733, Rev. 4)

C.G. DISABLE STRAPPING, MASTR II SINGLE TONE



PURPOSE: THIS MODIFICATION IS APPLIED TO MASTR II SINGLE - TONE ENCODE/DECODE CHANNEL GUARD (19D432500G1) OR SINGLE ENCODE/DECODE CHANNEL GUARD (19D432812G1) OPTION WHICH REQUIRE CHANNEL GUARD DISABLE STRAPPING OR TRANSMIT C. G. DISABLE (PER CUSTOMER REQUEST)

REQUIRED PARTS: 19A115250P1 OR 19A700028P1 DIODES.

INSTALLATION: TO THE PL19D432500G1 OR PL19D432812 CHANNEL GUARD BOARD PERFORM THE FOLLOWING FUNCTIONS.

1. TO DISABLE EITHER CHANNEL GUARD ENCODER OR DECODER ON A SPECIFIC CHANNEL, REFER TO THE APPROPRIATE CHART BELOW AND INSTALL A DIODE BETWEEN THE HOLES SPECIFIED.

CHANNEL	DECODE DISABLE		ENCODE DISABLE	
	CATHODE ⊣◀	ANODE	CATHODE ⊣◀	ANODE
1	H2	H1	H2	H17
2	H4	H3	H4	H18
3	H6	H5	H6	H19
4	H8	H7	H8	H20
5	H10	H9	H10	H21
6	H12	H11	H12	H22
7	H14	H13	H14	H23
8	H16	H15	H16	H24

EXAMPLE: TO DISABLE CHANNEL GUARD DECODE, TO MAKE AN "OPEN" CHANNEL, ON CHANNEL 3, INSTALL THE CATHODE OF A DIODE IN HOLE 6, AND ANODE IN HOLE 5.

IT IS POSSIBLE TO DISABLE BOTH ENCODE AND DECODE, BY INSTALLING BOTH DIODES.

(19C321875, Sh. 5, Rev. 1)

ADDENDUM NO.1 TO LBI31056B

This addendum describes Revision Letter changes that are not yet included in the publication.

REV.C- CHANNEL GUARD BOARD 19D432500G1
REV.B- CHANNEL GUARD BOARD 19D432500G3

TO IMPROVE CHANNEL GUARD DECODE SENSITIVITY. CHANGED R102 FROM 12K OHMS TO 22K OHMS AND R1003 FROM 47K OHMS TO 33K OHMS.

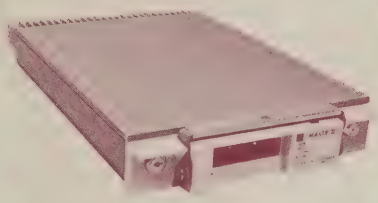
R1002 IS: 19A700019P53, DEPOSITED CARBON: 22K OHMS ±5%,1/4 W.
R1003 IS: 19A700019P55, DEPOSITED CARBON: 33K OHMS ±5%,1/4 W.

MOBILE RADIO

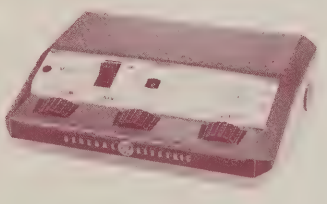
MASTR® II

MAINTENANCE MANUAL LBI 30250C

DATAFILE FOLDER – DF 9031

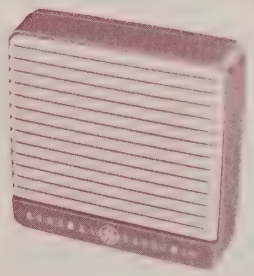


MOBILE RADIO



CONTROL UNIT

406-512 MHz
20/40/75/100-WATT
TWO-WAY FM
MOBILE
COMBINATIONS



SPEAKER

GENERAL ELECTRIC

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MAINTENANCE 3

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- Preventive Maintenance 3
- Test and Troubleshooting 3
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MECHANICAL PARTS BREAKDOWN 5

SYSTEM INTERCONNECTION DIAGRAM (See Control Unit & System Board Maintenance Manual)

ILLUSTRATIONS

Figure 1 - Module Layout 1

WARNING

Although the highest DC voltage in MASTR II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized 12-Volt circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

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EQUIPMENT INDEX

EQUIPMENT	MODEL OR TYPE NUMBER
Transmitter and Receiver	Refer to the Applicable Maintenance Manual
Exciter/PA Cable	5491689P86
Receiver Antenna Cable Standard With RF Pre-Amp (UHS)	 5491689P83 5491689P77
Control Unit	Refer to Applicable Control Unit Maintenance Manual
Microphone	Refer to Applicable Control Unit Maintenance Manual
Speaker	Refer to Applicable Control Unit Maintenance Manual
Antenna	Refer to Applicable Control Unit Maintenance Manual
Power/Control Cable	Refer to Applicable Control Unit Maintenance Manual
12-Volt Fuse Assembly	Refer to Applicable Control Unit Maintenance Manual
Ignition Switch Cable Assembly	19B219537G4
Microphone Bracket	7141414G2
Channel Guard Microphone Hookswitch	19C320318G1
Extractor Tool Kit	19B227456G1
Mounting Hardware	19A129474G1
Key (BF10A)	5491682P8
Alignment Tools	19B219676G1 19B219678P1
OPTIONS	
Power/Control Cables 9-Foot, 18-Conductor 9-Foot, 30-Conductor 9-Foot, 38-Conductor 27-Foot, 18-Conductor 27-Foot, 30-Conductor 27-Foot, 38-Conductor	 19D423424G1 19D423424G7 19D423424G13 19D423424G3 19D423424G9 19D423424G15
Handset Hookswitch	19C320478G1 19B219846G1
12-Volt 3-Wire Ignition Switch Cable Assembly	19B219537G1

SYSTEM SPECIFICATIONS*

FREQUENCY RANGE	406-512 MHz
BATTERY DRAIN	
Receiver	
Squelched	0.250 Amperes
Unsquelched	2.40 Amperes
Transmitter	
20 Watt (KT-35B,D)	6.0 Amperes at 13.8 VDC
40 Watt (KT-36B,D)	12.0 Amperes at 13.6 VDC
75 Watt (KT-112A,C)	19.0 Amperes at 13.6 VDC
100 Watt (KT-37A,C)	27.5 Amperes at 13.4 VDC
FREQUENCY STABILITY	
-40°C to +70°C +0.0005%	KT-35-B, KT-36-B, KT-112-A, KT-37-A
0°C to +55°C +0.0002%	KT-35-B, KT-36-B, KT-112-A, KT-37-A
-40°C to +70°C +0.0002%	KT-35-D, KT-36-D, KT-112-C, KT-37-C
DIMENSIONS (H X W X D)	
Two-Way Radio	2-1/2" x 11-3/4" x 18-3/4"
C-500 Series Control Unit (less bracket)	2-1/4" x 6-11/16" x 5"
Speaker (less bracket)	5-1/8" x 5-1/8" x 2-13/16"
WEIGHT	
Two-Way Radio (includes mounting plate)	26 pounds
C-500 Series Control Unit	1-1/4 pounds
Speaker	1-1/2 pounds
TEMPERATURE RANGE	-40°C to +70°C (-40°F to +158°F)
DUTY CAPABILITY	
Intermittent	20% Transmit, 100% Receive
Continuous	100% Transmit at reduced power

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits	10th Digit
Mechanical Package	System Voltage	Power Output	Channel Spacing	Frequency Capability	Number of Freq.	Options	Frequency Range	Oscillator Stability
M Standard	**C** ±12-VDC	**4** 20 Watts	**5** 25 kHz	**A** 1-Freq.	**A** 1-Freq. Xmit 1-Freq. Rec.	**S** Standard	**77** 406-420 MHz	**A** ±5 PPM (±.0005%)
	X ±12-VDC Less Accessories	**5** 40 Watts		**C** 2-Freq.	**B** 2-Freq. Xmit 1-Freq. Rec.	**U** Channel Guard	**78** 420-450 MHz	**B** ±2 PPM (±.0002%)
		6 75 Watts		**K** 8-Freq.	**C** 2-Freq. Xmit 2-Freq. Rec.	**P** UHS Receiver	**88** 450-470 MHz	
		7 100 Watts			**D** 1-Freq. Xmit 2-Freq. Rec.	**Q** UHS Receiver & Channel Guard	**89** 470-494 MHz	
					E 3-Freq. Xmit 3-Freq. Rec.		**91** 494-512 MHz	
					F 4-Freq. Xmit 4-Freq. Rec.			
					G 5-Freq. Xmit 5-Freq. Rec.			
					H 6-Freq. Xmit 6-Freq. Rec.			
					J 7-Freq. Xmit 7-Freq. Rec.			
					K 8-Freq. Xmit 8-Freq. Rec.			

DESCRIPTION

MASTR II mobile radio combinations are compact, highly reliable and ruggedly-constructed units that are designed to meet the most stringent requirements in the two-way radio field.

The radios are fully transistorized -- utilizing both discrete components and Integrated Circuits (IC's) for highest reliability. Since no tubes are used, the radio is ready to use the instant it is turned on. The standard combination may be equipped with the following:

- One through eight frequencies
- Plug-in oscillators for ±0.0002% or ±0.0005% oscillator stability
- Channel Guard (tone squelch)
- Ultra High Sensitivity (UHS) pre-amplifier

The radio set is housed in a drip-proof case only 2-1/2 inches high. The radio mounts to the vehicle by a bottom mounting plate, and is tamper-proof when locked into the mounting plate. When unlocked, the handle can be pulled down and the radio pulled out of the mounting plate or the top cover removed for servicing. When the handle is pulled down 90 degrees, the radio can be locked to hold the handle in the carrying position.

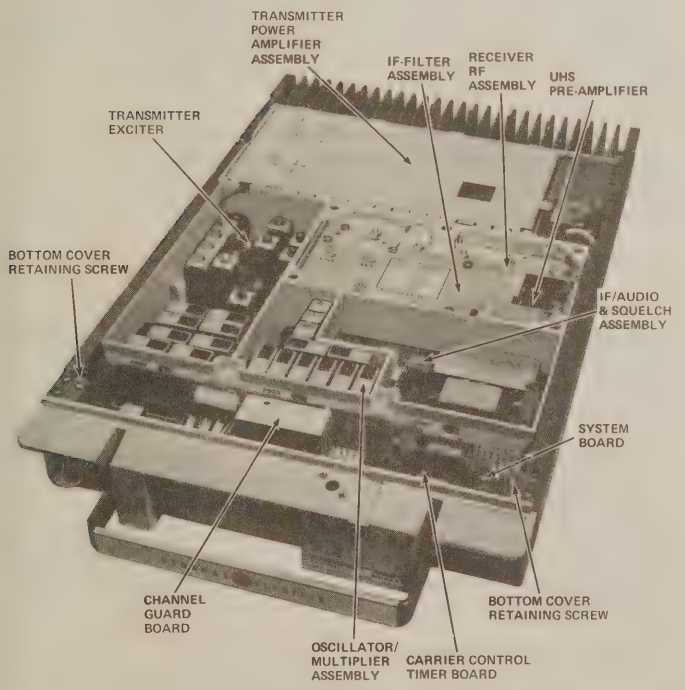

Figure 1 - Module Layout

No power supply is required since the highest supply voltage used in the radio is supplied by the vehicle battery.

The radio is of single-layer, modular construction with all major modules and tuning adjustments easily accessible from the top of the radio (see Figure 1).

Centralized metering jacks for the transmitter, receiver and system board are provided for simplified alignment and troubleshooting.

Both the transmitter and receiver are electrically isolated from the radio chassis to permit operating in 12-Volt, positive or negative ground vehicles without the use of a polarity converter. The transmitter exciter and receiver modules are mounted in a Lexan® frame for isolation. Simply changing four leads to the control unit and reversing the power leads at the plug end allows the radio to be used in negative or positive ground vehicles. No changes are required in the radio.

TRANSMITTER

The transmitter consists of an exciter board located in the mounting frame, and a power amplifier assembly. The PA assembly consists of a PA board(s) and a Low Pass Filter Board (with a hermetically sealed antenna switch) mounted on a heat sink casting.

RECEIVER

The receiver consists of an oscillator/ multiplier assembly (Osc/Mult), RF assembly, IF-Filter assembly, and IF-audio and squelch assembly (IFAS). In UHS receivers, the pre-amplifier mounts in the area near the antenna input board.

C-500 SERIES CONTROL UNIT

The control unit contains the power on-off rocker switch, volume and squelch controls, channel selector switch in multi-frequency models, a red transmit indicator light and a power on/frequency indicator light. Space is provided for an optional rocker switch, and two optional indicator lights.

The control unit is enclosed in a two piece molded Lexan® housing, and is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety. This mounting assembly also permits the control unit to be swiveled as desired for the convenience of the operator.

Three connectors are located on the rear of the control unit. Two of the connectors are for the control cable(s), and one (Vehicle Systems Jack J701) is for power, accessories and external options.

MICROPHONE AND HANDSET

MASTR II mobile combinations use a dynamic microphone with a built-in transistorized microphone pre-amplifier. The microphone is housed in a sturdy Lexan® case, and the extendable coiled cord plugs into the microphone jack on the bottom of the control unit. The plug is secured to the jack by a retaining screw.

An optional telephone-type handset is available for use with the radio. The handset uses a dynamic microphone with a built-in microphone pre-amplifier. The extendable coiled cord plugs into the microphone jack on the bottom of the control unit, and is secured to the jack by a retaining screw.

HOOKSWITCHES

In Channel Guard applications, a microphone or handset hookswitch is supplied with the radio. The hookswitches are equipped with a Channel Guard disable switch.

Placing the switch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the Channel Guard is disabled when the microphone or handset is removed from the hookswitch.

SPEAKER

A five-inch speaker contained in a Lexan® housing provides an audio output of 12 Watts. The speaker impedance is eight ohms. The speaker leads are terminated in Vehicle Systems Plug P701 which connects to J701 on the rear of the control unit.

The speaker is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety, and permits the speaker to be swiveled as desired to direct sound to the operator.

PRE-INSTALLATION CHECK

MASTR II radios are shipped from the factory completely connected to permit the serviceman to perform system checks on the transmitter and receiver without removing the radio from its shipping container. Simply removing the lid on the internal packing case provides access to the battery cables, ignition switch cables, microphone, control unit and radio antenna jack. The radio is shipped connected for 12-Volt, negative ground operation.

CAUTION

Before bench testing the MASTR II Mobile Radio, be sure of the output voltage characteristic of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed
(50 ohm resistive load): 18 Volts
Transmitter keyed
(no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limit shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.8 VDC for loads below 6 amperes; 13.6 VDC for loads of 6 to 16 amperes; 13.4 VDC for loads of 16 to 36 amperes). Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

INITIAL ADJUSTMENT

After the MASTR II Radio has been installed (as described in the INSTALLATION MANUAL), the following adjustments should be made by an electronics technician who holds a 1st or 2nd Class FCC Radio-telephone license.

Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form NP270303) has been filled out and attached to the transmitter.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the Forward and Reflected Power and adjusting the antenna length for optimum ratio, then setting the transmitter to rated power output (or to the specific output or input which may be required by the FCC station authorization). Next, measuring the frequency and modulation and entering these measurements on the FCC-required Station records. For the complete transmitter adjustment, refer to the ALIGNMENT PROCEDURE in the MAINTENANCE MANUAL for the transmitter.

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. For the Receiver Initial

Adjustment Procedures, refer to the FRONT END ALIGNMENT PROCEDURES in the MAINTENANCE MANUAL for the receiver.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR's MANUAL. The basic procedures for receiving and transmitting messages follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by pressing the POWER-ON rocker switch to the ON position.
2. Turn the SQUELCH control clockwise (to the right) as far as possible.
3. Adjust the VOLUME control until the noise is easily heard, but is not annoyingly loud.
4. Now, slowly turn the SQUELCH control counterclockwise (to the left) until the noise just fades out.

The radio is now ready to receive messages from other radios in the system.

TO TRANSMIT A MESSAGE

1. Turn the radio on as directed in the "To Receive a Message" section.
2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal voice. Release the button as soon as the message has been given. The red indicator light on the control unit will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever the transmitter is keyed.

MAINTENANCE

Removing IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the checks as listed in the table of Maintenance Checks.

TEST AND TROUBLESHOOTING PROCEDURES

The individual Maintenance Manual for the transmitter and receiver describe standard test procedures which the serviceman can use to compare the actual performance of the transmitter or receiver against the specifications of the unit when shipped from the factory. In addition, specific troubleshooting procedures are available to assist the serviceman in troubleshooting the transmitter and receiver.

NOTE

In positive ground operation only, A- is "hot" with respect to vehicle ground. Shorting the receiver front end casting or any printed wiring board ground patterns to the radio case may cause one of the in-line fuses to blow.

MECHANICAL PARTS BREAKDOWN

A mechanical parts breakdown diagram of the two-way radio is provided in this manual. The diagram shows the placement and GE Part Number of mechanical items on the Two-Way radio set (see Table of Contents).

RE-INSTALLATION

If the radio is ever moved to a different vehicle, always check the battery polarity and voltage of the new system before using the radio.

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

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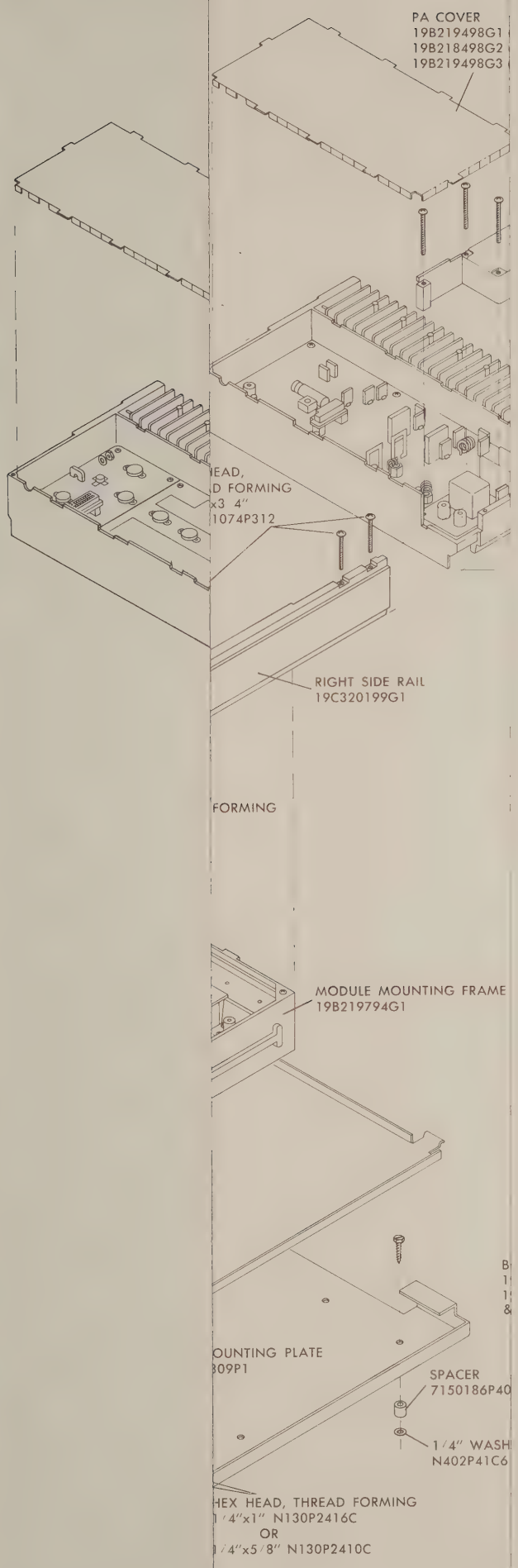

MECHANICAL PARTS BREAKDOWN

MASTR II STANDARD COMBINATIONS

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

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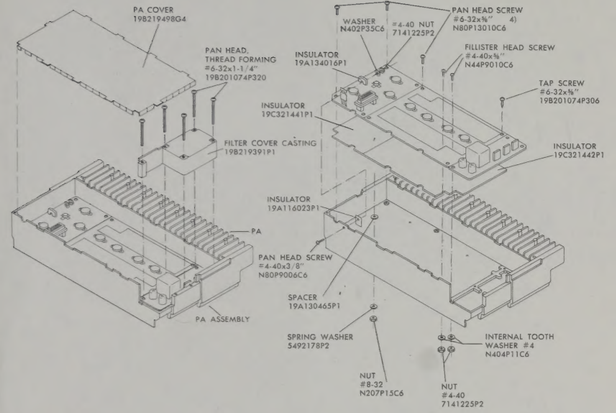
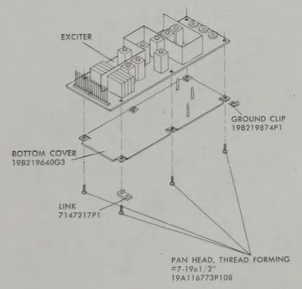
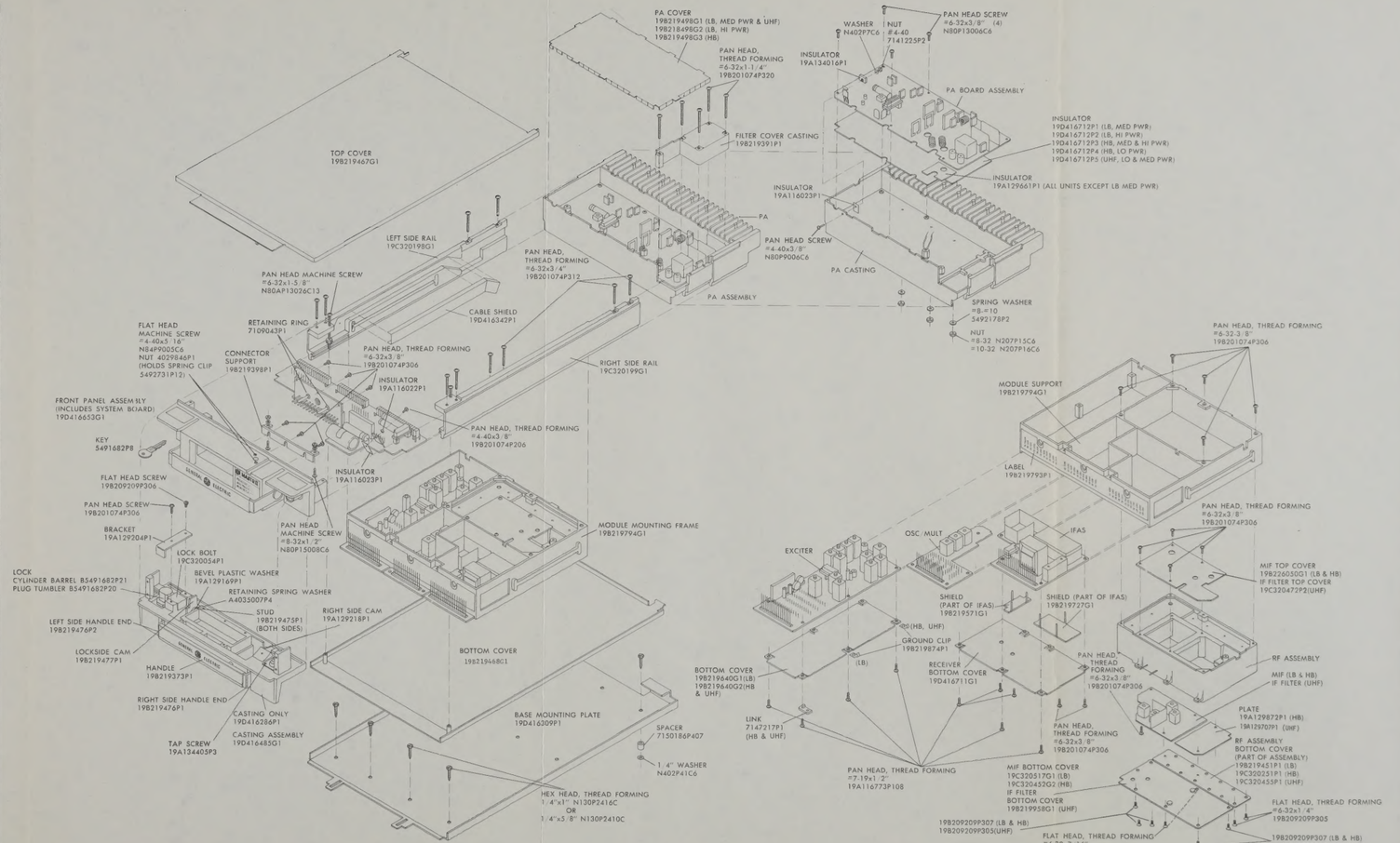




MECHANICAL PARTS BREAKDOWN

UHF TRANSMITTER MODULAR PA ASSEMBLY


PA COVER 19B219498G1 (LB, MED PWR & UHF) 19B218498G2 (LB, HI PWR) 19B219498G3 (HB)
PAN HEAD, THREAD FORMING #6-32x1-1/4" 19B201074P320
WASHER N402P7C6
NUT #4-40 7141225P2
PAN HEAD SCREW #6-32x3/8" (4) N80P13006C6
INSULATOR 19A134016P1
PA BOARD ASSEMBLY
INSULATOR 19D416712P1 (LB, MED PWR) 19D416712P2 (LB, HI PWR) 19D416712P3 (HB, MED & HI PWR) 19D416712P4 (HB, LO PWR) 19D416712P5 (UHF, LO & MED PWR)
INSULATOR 19A129661P1 (ALL UNITS EXCEPT LB MED PWR)
FILTER COVER CASTING 19B219391P1
TOP COVER 19B219467G1
INSULATOR 19A116023P1
PA
PAN HEAD SCREW #4-40x3/8" N80P9006C6
PA CASTING
PA ASSEMBLY
SPRING WASHER #8-#10 5492178P2
NUT #8-32 N207P15C6 #10-32 N207P16C6
LEFT SIDE RAIL 19C320198G1
PAN HEAD, THREAD FORMING #6-32x3/4" 19B201074P312
PAN HEAD MACHINE SCREW #6-32x1-5/8" N80AP13026C13
CABLE SHIELD 19D416342P1
FLAT HEAD MACHINE SCREW #4-40x5/16" N84P9005C6 NUT 4029846P1 (HOLDS SPRING CLIP 5492731P12)
RETAINING RING 7109043P1
CONNECTOR SUPPORT 19B219398P1
PAN HEAD, THREAD FORMING #6-32x3/8" 19B201074P306
INSULATOR 19A116022P1
RIGHT SIDE RAIL 19C320199G1
FRONT PANEL ASSEMBLY (INCLUDES SYSTEM BOARD) 19D416653G1
PAN HEAD, THREAD FORMING #4-40x3/8" 19B201074P206
KEY 5491682P8
FLAT HEAD SCREW 19B209209P306
INSULATOR 19A116023P1
PAN HEAD SCREW 19B201074P306
BRACKET 19A129204P1
PAN HEAD MACHINE SCREW #8-32x1/2" N80P15008C6
MODULE MOUNTING FRAME 19B219794G1
LOCK BOLT 19C320054P1
LOCK CYLINDER BARREL B5491682P21 PLUG TUMBLER B5491682P20
BEVEL PLASTIC WASHER 19A129169P1
RETAINING SPRING WASHER A4035007P4
STUD 19B219475P1 (BOTH SIDES)
RIGHT SIDE CAM 19A129218P1
LEFT SIDE HANDLE END 19B219476P2
LOCKSIDE CAM 19B219477P1
HANDLE 19B219373P1
BOTTOM COVER 19B219468C1
RIGHT SIDE HANDLE END 19B219476P1
CASTING ONLY 19D416286P1
CASTING ASSEMBLY 19D416485G1
TAP SCREW 19A134405P3
BASE MOUNTING PLATE 19D416309P1
SPACER 7150186P407
1.4" WASHER N402P41C6
HEX HEAD, THREAD FORMING 1.4"x1" N130P2416C OR 1.4"x5/8" N130P2410C
PAN HEAD, THREAD FORMING #6-32-3/8" 19B201074P306
MODULE SUPPORT 19B219794G1
LABEL 19B219793P1
EXCITER
OSC MULT
IFAS
PAN HEAD, THREAD FORMING #6-32x3/8" 19B201074P306
MIF TOP COVER 19B226050G1 (LB & HB) IF FILTER TOP COVER 19C320472P2(UHF)
SHIELD (PART OF IFAS) 19B219571G1
SHIELD (PART OF IFAS) 19B219727G1
(HB, UHF)
GROUND CLIP 19B219874P1
(LB)
RECEIVER BOTTOM COVER 19D416711G1
PAN HEAD, THREAD FORMING #6-32x3/8" 19B201074P306
RF ASSEMBLY
MIF (LB & HB) IF FILTER (UHF)
BOTTOM COVER 19B219640G1(LB) 19B219640G2(HB & UHF)
LINK 7147217P1 (HB & UHF)
PAN HEAD, THREAD FORMING #7-19x1/2" 19A116773P108
PAN HEAD, THREAD FORMING #6-32x3/8" 19B201074P306
PLATE 19A129872P1 (HB) 19A129870P1 (UHF)
RF ASSEMBLY BOTTOM COVER (PART OF ASSEMBLY) 19B219451P1 (LB) 19C320251P1 (HB) 19C320455P1 (UHF)
MIF BOTTOM COVER 19C320517G1 (LB) 19C320452G2 (HB)
IF FILTER BOTTOM COVER 19B219958G1 (UHF)
FLAT HEAD, THREAD FORMING #6-32x1/4" 19B209209P305
19B209209P307 (LB & HB) 19B209209P305(UHF)
FLAT HEAD, THREAD FORMING #6-32x7/16" 19B209209P307
19B209209P307 (LB & HB) 19B209209P303(UHF)

MECHANICAL PARTS BREAKDOWN

MASTR II STANDARD COMBINATIONS

Issue 3

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